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International Association for Dental Research. Proceedings of the Thirteenth General Meeting, Chicago, Ill., Mar. 16 and 17, 1935. Compiled by *William J. Gies*, F.A.C.D., *Secretary:*

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# INTERNATIONAL ASSOCIATION FOR DENTAL RESEARCH

## Proceedings of the Thirteenth General Meeting[1]

## Stevens Hotel, Chicago, Illinois

## March 16 and 17, 1935

Compiled by WILLIAM J. GIES, F.A.C.D., *Secretary*[2]

*Columbia University, New York City*

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[1] The sessions of the Research Association preceded, by agreement, those of the Twelfth Annual Meeting of the American Association of Dental Schools, in the same hotel, March 18–20. The members of each body were welcome at, and participated in, the sessions of both associations. The chairmen were the President, Dr. J. L. T. Appleton, Jr., University of Pennsylvania; the Vice-president, Dr. W. G. Skillen, Northwestern University; and the President-elect, Dr. T. B. Beust, University of Louisville. The annual informal dinner, served to members and guests on the evening of March 17, preceded the concluding session and was attended by 128 persons. The Presidents' address and abstracts of the papers, at the general meeting in 1934, were published in the *J. Den. Res.*, 1934, *14*, 153–237; June.

[2] Most of the abstracts have been prepared by those who presented the corresponding papers. All editorial revisions have been verified by the authors.

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## I. Address of Retiring President[3]

*J. L. T. Appleton, Jr., B.S., D.D.S., Dental School, University of Pennsylvania, Philadelphia, Pa.*

Although I am standing, I am speaking *ex cathedra.* At least I hope you will be duly impressed by the few, poor reflections and suggestions which I make as retiring president. Will you graciously grant them a consideration which you might not otherwise be inclined to give?

At last the relation of this Association to the *Journal of Dental Research* is taking definitive form. The obligation to maintain, continue and extend it, we have assumed—not because we could afford a luxury but because the logic of the case allowed no other disposition. Frankly, we felt that if we accepted our manifest destiny, we could count upon the profession at large not to let us fail. Our sincere thanks are due to those societies and organizations which have contributed moral and money support to this journal. May their numbers increase!

The proposal has been made to have certain of the more technical, abstruse, or non-clinical papers, which in the past have appeared in the *Journal of the American Dental Association,* published in the *Journal of Dental Research.* The realization of such a proposal seems mutually advantageous. Emphatically there is a place in dentistry for the *Journal of the American Dental Association* and for the *Journal of Dental Research.* They are not in any sense in conflict. The gain to one is not at the expense of the other. The *Journal of the American Dental Association* should be keyed to the interests of the general practitioner; and although we hope he will become increasingly aware of the importance of research and of its ultimate utility, the simple fact is that his interest in research is largely academic.

I have attempted to classify the articles which appeared in the first

[3] Read at the dinner preceding the sixth session (p. 191).

thirteen volumes (1919–1933, inclusive) of the *Journal of Dental Research.* Papers which contained little or no original material, and papers which appeared in society proceedings, were not included. In all, there were 397 separate entries. Each paper might account for more than one entry. The percentage distribution of the entries, according to the classes having more than 1 percent of the total entries, follows: amalgam, 1.2; anesthesia, local, 1.2; bacteriology, 9; bone, 2.2; casting, 1.2; dental caries, 9.5; dental histology, 2.7; diet, 7.3; enamel, 9.5; endocrines, 1.5; focal infection, 6; operative dentistry, filling teeth, 2.5; oral hygiene, 3.7; parodontosis, 5; periapical infection, 5.5; phylogeny of teeth, 2; prosthesis, 2.5; pulp pathology, 2.2; saliva, 2; tooth development, 3; tooth pastes, etc., 3. From such a classification, in spite of its necessary bias, I had hoped to see emphasized the neglected and relatively untilled fields. I am not sure I can pick them out. It is surprising, however, that studies on saliva comprised only 2 percent of the entries. Pharmacology would seem to deserve more attention than it has received. Although an almost endless variety of fundamental and fascinating problems center about the growth of the face, few of them have received due or exhaustive consideration. The oral manifestations of systemic or extra-oral disease, and the oral neoplasms, have received too scant attention. This classification clearly reveals the well recognized preponderance of research in the "biological" field over research in the "mechanical" field. In the period under consideration this is perhaps as it should have been. But wouldn't a balanced ration for the profession of today require an increase in investigations into what may be called the physics and chemistry of dental materials? These are personal impressions of current needs and shortcomings. I would be the last one in this room to wish for a lessening of interest in the "biological" field, but there are other phases of dentistry in no less need of careful cultivation.

An adequate indexing of its literature is an enormously useful tool in the advancement of any science or profession. In this connection I have a proposal to make, often voiced in private but never before presented publicly. The conception and execution of the *Index to Periodical Dental Literature* deserve high praise and gratitude. It is an accomplishment of which the dental profession may well feel proud.

But now that this task is practically completed as far as the literature of past years is concerned it is appropriate to pause, to ask what should be the future policy. In the first place I am in hearty agreement with the following quotation from a paper by Mr. Hackh (*Journal of Dental Research*, 1934, April; *14:* 145): "The very principle upon which the *Index to Dental Periodical Literature* is based is in error, for it is a classified index. . . . An index, in order to be simple and efficient, should be alphabetical. The best index is the so-called 'dictionary index'. . . ." In the second place, in the *Index to Dental Periodical Literature* are indexed only articles appearing in English-language journals—and we all know that some of the best research reports are appearing in other modern languages. In the third place, in the *Index* only dental journals are indexed—although we all know that many articles of great value to students of dental problems are appearing in the literature of medicine, and of the other arts and sciences. In the fourth place, in the *Index* many journals are indexed which are not worth the paper they are written on. Some of them are of the so-called "throw-away" type; some are flagrant examples so rightly exposed in the Report of the Commission on Journalism of the American College of Dentists.

We all have to depend on the *Cumulative Index Medicus*. At the present time this publication indexes certain dental journals in English and in other modern languages. Unfortunately these dental journals are only partially indexed. My proposal is that the American Dental Association enter into negotiations with the American Medical Association looking toward the complete indexing in the *Cumulative Index Medicus* of the most important dental journals in all modern languages. This extension would probably entail added expense in the production of the *Cumulative Index Medicus*. The American Dental Association should meet this expense. My surmise is that the amount needed would be far less than it would cost the American Dental Association to continue the *Index to Periodical Dental Literature* according to the lines followed in the past. I am not urging this proposal, however, as a measure of economy—although the fact that there are no economic objections to its adoption is a point in its favor. Here is an excellent opportunity for the organized professions of medicine and dentistry to cooperate effectively.

There is a phase of research to which I would respectfully direct your favorable attention. It is a sort of police duty. Our first reaction to its claims is probably to regard it as a nuisance and an interruption in the prosecution of our own pet interests. However it is a matter of urgency. It concerns broadly the public welfare and the welfare of dentistry, and if we be socially minded cannot be ignored. Until the American Dental Association supports its Council on Dental Therapeutics as the American Medical Association supports its Council on Chemistry, we have a moral obligation to fulfill. I can bring out my point best by quoting from a letter from Doctor S. M. Gordon, Secretary of the Council on Dental Therapeutics: ". . . . . the work of the Council, which is aimed to act as a check on the commercial exploitation of scientific advances to dentists, can go so far only as it has the assistance of the few qualified research workers in dentistry. Most of those are members of the International Association for Dental Research." Reports of studies of this type, especially on the claims of certain dentifrices and mouth washes, are contained in the earlier volumes of the *Journal of Dental Research.* The *Journal of the American Dental Association* seems the logical vehicle for such reports in the future, as the widest diffusion of the facts revealed among the rank and file of the profession is most desirable. May I beg of you—when the chance of doing police duty of this kind comes to you—not to say "no" too hastily?

With a rashness now regretted I circulated a questionnaire among the already over-burdened sectional secretaries. I want to thank these members for the pains they have taken. Some of you may be interested in a report on the patiently and carefully prepared replies. Special funds or grants, aside from regular university budgets or dental-school budgets, are reported from Ann Arbor, Northwestern, Columbia, N. Y. Institute of Clinical Oral Pathology, National Bureau of Standards, U. S. Public Health Service, Rochester (N. Y.), Halifax (N. S.), Harvard, and Yale. There is also, I believe, a large endowment for dental research at the University of Chicago, although I have no official information on this point. Among the grantors are the Rackham Fund, Commonwealth Fund, Carnegie Corporation, Rockefeller Foundation, Milton Fund, American Dental Association, Dominion Dental Council of Canada, American Society of Oral Sur-

geons and Exodontists, and the Federal Government. Some of the replies to the questionnaire gave the specific amounts of the grants. Although these may be no secret, I shall not reveal them. Comparisons are odious and, these days of the "pink slip," anyone who has any money seems anxious that no one else should learn about it. However, the number of grants and the amounts involved are pitifully small when compared with the gifts and grants to medicine. In the department of Medical News in the *Journal of the American Medical Association* for the year 1934 are announced gifts to medicine amounting to $34,774,232. Of course all this did not go directly for medical research, and I have no way of accurately estimating the fraction available for that purpose. Possibly some of this money indirectly will facilitate dental research. The point I wish to make is that, even in a period of wide-spread and intense economic stringency, an almost fabulous sum was added to the resources designed for the care of the sick and for the prevention of illness. In view of what we already know, and *especially in view of what we do not yet know* concerning the relation of mouth disease to general health, it seems that possibly the public interest would be better served if a small fraction of these millions of dollars could annually trickle into dental research. Let us see if we can switch our metaphors without getting them mixed. If the blood supply to a part be cut down below the minimum needed to permit it to meet its functional responsibilities to the organism as a whole, then the organism as a whole will suffer. Dental education and dental research have always existed in a state of chronic undernourishment. They cannot adequately perform their function in the maintenance of public health until the social organism provides adequately for their nourishment.

Dentists attached to hospitals have unusual opportunities for delving into the unknown. As a rule this group is exceptionally alert mentally. But haven't they on the whole been a little too surgically minded? There is more for a dentist to do in a hospital than to interpret x-rays, extract teeth, or splint or wire fractured jaws, important as these activities are. He has, as no other group has, the chance to develop the whole field of medico-dental relationships systematically and scientifically. I would like to see more clinical research undertaken. Too many clinicians unfortunately labor under

the illusion that scientific research is a thing of test-tubes, balances, incubators, microscopes and microtomes. This belief deters too many clinicians from really developing their talents and from taking advantage of their opportunities. It is erroneous and harmful. In order to emphasize the fallacy, I am asking your indulgence while I briefly sketch what science is. Science is what we learn by means of the scientific method. It is this method that is essential. This method can be applied to a wide variety of subject-matters and materials. It certainly can be applied to the problems of clinical dentistry and medicine. In its complete form this method comprises five steps: (*1*) the making of accurate, comprehensive, unbiased, controlled observations; (*1*) the assertion of rational, testable relations among these observations (hypotheses); (*3*) from these hypotheses, inferences or deductions are drawn; (*4*) these inferences or deductions are in turn subjected to direct observation; (*5*) according to the outcome of these observations it may be necessary to abandon or to modify the hypothesis. And so the game goes on endlessly. Now I would apply (and limit) the word "scientist" to anyone who engages systematically in any one or more of these five activities. Scientific research is the honest, intelligent performance of any one or more of these five activities. This scientific method is not a patentable method. According to this view the clinician may engage in research. The subject-matter of his research being, of course, his patient.

In a monograph, as yet unpublished, on "the oral surgical service as an integral part of modern hospital organization; a systematic plan of management," Dr. Malcolm W. Carr does justice to the opportunities for, and the desirability of, research by the dentist on the staff of a hospital. If the oral-surgery staff be large enough, he advises that there be a standing committee on clinical research. "A basic plan of research should be formulated with respect to the problems to be investigated, and a systematic method of recording identical data on every case selected for study should be devised. . . . Effort should be made to correlate the features of physical examination with bacteriological, pathological, and histological findings. Systematic detailed records of history and findings are essential. Publication of medico-dental case reports of patients . . . by staff members should be encouraged. Medico-dental case reports of focal-infection studies

make valuable contributions to both medical and dental literature and monographs on the various diseases of the mouth, and the oral manifestations of systemic disease are also particularly desirable subjects for publication."

Most dentists on hospital staffs are, as the saying goes, "rushed to death." Their opinion is asked on a great variety of cases and their experience tends to be too diffuse. If a dentist were willing to concentrate such time as he could afford to give, upon *one* of the medical services over a period of 5, 10 or more years, we might eventually reach a reliable conclusion regarding the interrelation of oral disease and the group of diseases treated on that service. Thus, I would have a dentist limiting such time as he could give, to the hospital, to the study of patients suffering from diseases of the chest; another dentist for the neurological clinic; another to urology; another to dermatology, etc. The dangers of specialization could be combated by staff meetings at which cases from the several clinics or services would be presented and discussed. I have great faith that the scientific method can be successfully applied directly to clinical problems. What the atom is to the chemist, or the cell to the biologist, so is the individual patient or "case" to the medical or dental clinician.

Most dental schools seem to have standing faculty committees on research. While I agree heartily in principle that committees are nuisances, will not the representatives from dental schools not having research committees ask themselves whether, under the conditions obtaining, such a committee might be useful in sponsoring and in coördinating research? May I offer a suggestion based on my own experience? For several years at Pennsylvania the dental faculty has had a committee on research. Annually the following questions are asked of the heads of the several departments: (*1*) What research is in progress in your department? (*2*) What research is projected? (*3*) What students give promise of developing research qualifications? (*4*) Do you keep careful clinical records of cases, full enough and accurate enough to serve as dependable data for research workers? (*5*) Will you kindly record a bibliographical list of books or contributions to periodical literature written by you or by members of your staff since ( . . . the past year)? (*6*) Remarks. The answers to these questions are summarized with such comments as seem appropriate,

mimeographed, and distributed to the faculty as the report of the committee. Heads of departments in which research is not being done are now beginning to feel that apologies are called for.

Question 3, above, "What *students* give promise of developing research qualifications?," has important implications. Let me quote from the comment on this question in a recent report: "That interesting the undergraduate in original investigation is an important part of teaching, is self-evident. It is awakening in him the desire to seek and find out for himself, instead of allowing him to be the passive recipient of information obtained by others, which starts him on the road toward knowledge and toward scholarship. Also, from this encouragement in original investigation, students are discovered (and discover themselves) who are especially qualified as research workers." Dental research needs money, physical facilities, time, organization, and vehicles for the exchange of ideas—all these it needs—but most of all it needs men and women who will work and who will think. If we are to find them, let us first look for them among the undergraduates of our schools.

And now—one last word. To the Chicago Section are due our thanks for the many courtesies they have shown and for the facilities they have made available. To Doctor Gies—I know I am voicing the sentiment of all of you—goes our heartfelt gratitude for his unremitting and unselfish labors.

## II. Introduction of President-elect[3]

*Paul C. Kitchin, M.S., D.D.S., Vice-president-elect; Dental School, Ohio State University, Columbus, Ohio*

It has been my pleasant assignment to act as the instrument through which our newly elected President should be introduced, as such, to this gathering. Personally I dislike introducers as a class. They appeal to me as "strange interludes" in an otherwise enjoyable affair; barriers to be surmounted before the really worthwhile things assume the stage. An avowed enemy makes the best introducer since the one introduced knows what to expect, at least he expects the worst. Mark Twain, in a very sane moment, said that a man's enemy can work his partial ruin but it takes his well-intentioned friend to do a

consummate piece of ruining. Introducing may be a mere formality or possibly it might be made to serve some useful purpose. Supposing that we endeavor to collect into a short narration some information, not too personal, concerning our honored member in his association with dentistry and with his interests outside of the profession? Let us begin at the beginning.

The new President is a Hoosier by birth; place of nativity, New Albany, Indiana, where he remained to complete his high-school training. We next find him a student at the Louisville College of Dentistry and the Hospital College of Medicine, Louisville, Kentucky, where respectively he received the degrees of D.D.S. and M.D. These institutions later became affiliated with the University of Louisville as its Colleges of Dentistry and Medicine. In 1892 he returned to New Albany and entered the practice of dentistry, which he continued for the succeeding four years. While making an European tour he became interested in dental conditions in Dresden, Germany, and established himself in practice there in 1897. Actively interested in the "how and why" of his work, he founded, in 1904, a private research laboratory. His first reports in science subjects were published in 1905. Previous to this date, however, several articles had already appeared, dealing with dental operative procedures, the first in 1900. The work in Dresden continued for ten years, during which period fifteen biological publications and three on operative procedures were produced. During the second year of the World War political conditions became such that aliens, especially citizens of the United States, were no longer welcome in Germany and our President and his family succeeded, not without considerable difficulty, in returning to this country. It was necessary to abandon to the fortunes of war the valued possessions accumulated during eighteen years and face the hard necessity of starting anew; a difficult battle, valiantly and successfully waged. In 1917 he became associated with his Alma Mater, first as Professor of Bacteriology and Biology; later as Professor of Dental Histology, Comparative Dental Anatomy and Research, the position he now occupies.

For only a brief period, during the troublesome times of the War, has a single year passed in which he has not made a contribution to dental literature. Since 1918 there have appeared thirty-nine articles

and a textbook on dental histology and embryology. The entire list of his publications, over fifty in all, can be generally classified as follows: (*1*) ***Morphology of oral organisms.***—Of fundamental importance in this field is "Contribution to the morphology of the micro-organisms of the mouth," *Dental Cosmos*, 1908. (*2*) ***Immunity to dental caries.***—Two of the most important in this division are "A contribution to the study of immunity to caries," *Dental Cosmos*, 1912; and "Resistance to caries," *J. Dent. Res.*, 1931. (*3*) ***The establishment of the anatomical arrangement of the enamel tufts.***—Important contributions here are "Physiological changes in the enamel after tooth eruption," *J. Amer. Den. Assoc.*, 1924; and "The capillaries of the enamel and their relation to mottled teeth," *Ibid.*, 1926. (*4*) ***The concept of tooth "maturation" and the general occurrence, significance and demonstration of dentin "sclerosis."***—Illustrative of this phase of activity is "Reaction of the dentinal fibril to external irritation," *Ibid.*, 1931. (Space limitations forbid detailed listing of contributions, but the above is suggestive of our incoming President's interests down through the years.)

Since 1922 he has been a grantee of the Research Commission of the American Dental Association, and much of his recent work has been done in that connection. His Alma Mater has recognized him by making him the first recipient of the Award of Merit of the University of Louisville, given to the faculty member contributing the most to the advancement of science and research. He is a Fellow of the American College of Dentists, and a member of the New York Academy of Dentistry and of Omicron Kappa Upsilon.

Indicative of his modest attitude I quote his reaction to these references to his accomplishments and honors. He said: "I heartily dislike to stand before an audience for the purpose of having my virtues extolled . . . if any achievements are obvious, then well and good." The achievements are very obvious and I can only hope that he will speedily pardon me for having publicly "extolled his virtues."

No list of published work, however formidable, can express that side of a man's character which is evident in his associations with his fellows. If I failed to comment upon the uniform kindliness and courtesy, and the sincere interest, which this man always shows, especially toward the younger members of this group, I should indeed

be remiss. It is also well that we should know something of his wide interest outside of dental matters, in biology in general, in historical geology, and in music. He is a disciple of Isaac Walton, too; and although he might lead you to believe that his catch interests him primarily from the standpoint of comparative dental anatomy, I think he really enjoys fishing.

And now as an investigator, as an educator, and as a cultured gentleman in the best sense of the word, I have the appreciated privilege of presenting the newly elected President of the International Association for Dental Research, Dr. Theodore Bernhard Beust.

## III. Inaugural Address[3]

*Theodore B. Beust, D.D.S., M.D., F.A.C.D., Dental School, University of Louisville, Louisville, Ky.*

A conventional inaugural address should appropriately arouse enthusiasm and instill optimism. It commonly contains a liberal seasoning of more or less feasible predictions, as well as numerous promises in which fidelity and subordination are pledged to the members. The industrialist envisions to his allies a boundless turnover; the labor leader portrays Utopian conditions with short hours and high wages; while the politician suggests the existence of a great tree beset with luscious plums. It is obvious that the incumbent of a research society, composed of men peculiarly disposed to originality in attitude and by training accustomed to form independent conclusions, cannot lightly feed his constituency on clichés. Nor can other ordinary methods of approach be expected to reach any considerable number. The heterogeneous nature of such a body precludes the presence of a mass psychology; it even conduces to an absence of association-mindedness. Under the latter term may be conceived a proper feeling of fellowship.

About fifteen years ago, after our esteemed General Secretary, William J. Gies, had nurtured the seed of our organization through a gestation period of several years, a stage of maturation was reached in which it could burst into bloom. At that time three sections, numbering collectively only forty members, composed its roster. Today nearly four hundred independent workers, each engrossed in a specific line of research, demand adjustment in a mold best adapted to achieve-

ment of the functions of a research society. A high degree of associableness—a universal intra-associational feeling of fellowship, as distinguished from the fraternization now existing within smaller groups—would facilitate harmonious endeavor. This would militate against any tendency toward the formation of factions, eliminate the spirit of rivalry, and banish an insidious malignancy which may be called "politics." The wide geographical distribution of our members is an obstacle to intimate association. Yet a potent bond of mutual attraction will be found in the work itself. An awakened spirit of coöperation would evoke a feeling of fellowship. The ties between our members could be greatly strengthened by the exercise of extreme care in the framing of research reports. Let us suppose, for example, that certain new concepts which have appeared in our literature have assumed vital importance in current reasoning. These are frequently seized upon, often subconsciously, without regard for the rules of authorship. Evasion of the precepts of courtesy creates ill feeling, paralyzes ardor, and retards progress. A voluminous bibliographic list does not necessarily imply a full measure of courtesy. Not infrequently a contribution is garnered with concepts that are alien to its producer. Such digressions are not necessarily malicious. They may be symptomatic of a laxity that many of us share.

A comparison of our writings on stomatologic subjects with the German literature of the same type often discloses a more profound regard for courtesy by the latter. In Europe digressors from the rules are commonly summarily exposed; in America we are expected to "forget it," which sometimes is rather difficult. The European contribution, if the nature of the subject permits, commonly begins with a summation of the known facts together with a mention of their authors. To the picture thus provided the writer adds his original work, which in the majority of instances can be done in relatively few words. Such a course makes for solidarity, promotes amicable relations with men working in allied fields, and contributes to universal happiness within the research family.

It is said that the culture of a nation may be learned from the quality of its literature. This statement may be applied, with equal justification, to the publications of an organization. A research society which lacks printed records of the activities of its members is

an incongruity. The final disposition of a successful piece of research is the adoption of means for insuring its accessibility to posterity. Industrious investigators when solving specific problems frequently find themselves in territory in which all ties with contemporary science are lost. Few pieces of research are adaptable for immediate consumption. Months or years may elapse before they are integrated into the fabric of the time. Without means for permanently recording the findings, the futility of expenditures of energy are evident. Solicitous regard for a medium of dissemination for research reports is therefore more than important, it is a necessity! Many of the older men must have experienced severe disappointment when, after months or years of labor, their productions, in the absence of a proper medium, were reluctantly consigned to graves in journals edited for the immediate needs of dental practitioners. Research papers having an obvious relation to questions of daily practice, such as caries, physical properties of filling materials and tooth structure, were eagerly evaluated by dentists. Work of indirect application, however, found little favor. The editors of these journals deserve enduring gratitude and commendation for giving space to matter of a kind that at best was read by an insignificant number of their subscribers. Again thanks to the editors who made such publications possible. Thanks also to the promoters of indices that have catalogued the world's dental literature; who increased the possibilities of resurrecting the works of merit that still lie unused in the journals. The American Dental Association, which, through its Research Commission, emphasized the desirability of research, has wrought great changes in attitude. Modern dental educators, too, have so hastened the evolution of the dental student that a science article in a journal of practical dentistry no longer assumes the proportions of the proverbial log that was "too tough to chop and too soggy to burn." Unfortunately the journals of practical dentistry can no longer find space for the wealth of papers on science subjects that today is flooding the editorial offices. Few authors of research papers have escaped the vexation of waiting six, twelve, eighteen months, or longer, for the appearance of reports that have been read at meetings and subsequently accepted for publication. Not uncommonly the vital parts of the papers, when they do appear, have been appropriated by others.

From what has been said it is singularly practical that research societies should edit their own journals. It has been our good fortune to have inherited a journal that stands on the highest pinnacle of American research publications. Here again the prescience and indefatigableness of William J. Gies have erected a structure that in origin and development parallels that of the International Association for Dental Research. The *Journal of Dental Research*, together with the International Association for Dental Research, stand for the highest ideals in dental science. The one is indispensable to the other. In the short fifteen years of their respective lives both have evolved a patina that in refinement will bear the most critical scrutiny. It has now become our duty to uphold their traditions by maintaining, in unbroken tenor, the principles that created them. We now have the *Journal*, thanks to the individuals and dental organizations that have heretofore supported it. The courage and enterprise that have made the *Journal* possible will not be allowed to wane. We have our contributors, we have our appreciative circle of readers, and we have a Board of Editors which will leave nothing undone to uphold all standards. With the proper degree of association-mindedness, the day will not be far distant when, instead of issuing a yearly volume of predetermined size, we may think of releasing volumes as quickly as material for their completion has been accepted for publication This would give us more than one volume yearly. This method has already been practised with success. In order to insure variety, contributions should preferably be limited to a very few pages; or, as an alternative, more lengthy papers should be distributed over a number of volumes. Such a practice would promote progress in our work and, in addition, would obviate the enervating, often distressing, delays that discourage enthusiastic workers.

Help your journal! Make it a medium of intimate communication with your fellow-members. Discuss their work. Problems are clarified by constructive comment. Spontaneous criticism advanced at a congress is enriched in import if recorded in a journal. Such interest should not annoy, it should be greeted. Be magnanimous, yet not ashamed to uphold claims for priority. Those who countenance leniency possess the least claims on originality. The fruits of your labor are rightly yours. Your community and your alma

mater expect you to achieve. Do not adhere to codes founded on distorted principles. Shoot straight; and above all, cultivate that friendliness that should exist within a family united in the quest of knowledge.

### IV. Index of Names of Participants, and Sequence Numerals of Corresponding Abstracts

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### V. First Session: Morning, March 16; Abstracts 1–8

1. Hereditary anomaly in structure of dentin. *Frederick B. Noyes, B.A., D.D.S., Sc.D., F.A.C.D., College of Dentistry, University of Illinois, Chicago, Ill.* The cases studied seem to present an hereditary anomaly in structure of the dentin. All of the patient's teeth, both temporary and permanent, had a peculiar bluish-brown color. The temporary teeth crumbled until only nubs remained. The difficulty was supposed to be in the enamel, but microscopic examination of the temporary teeth and macroscopic examination of the permanent teeth showed that the enamel is normal in structure. X-ray examination of all teeth show apparently complete obliteration of pulp chambers and canals. Microscopic examination shows (*a*) only minute remains of dental pulp; (*b*) typical tubular arrangement of

dentin has disappeared; (*c*) minute irregular tubes are abundant, but their characteristic arrangement is lacking; (*d*) dentin matrix is increased in amount and shows peculiar staining reactions. The patient's father and half-sister have teeth of the same character. [Dr. Roberts' paper (abstract 116) gives a complete genetic study of what seems to be an identical condition.]

2. NASO-PALATINE DUCT AND JACOBSON'S ORGAN IN NEW-BORN INFANTS.[4] *Harold J. Noyes, B.S., D.D.S., M.D., College of Dentistry, University of Illinois, Chicago, Ill.* Tissues were fixed in 10 percent formalin and blocks cut from the median anterior portion of the palate in such manner that they were bounded laterally by planes passing through distal portions of the deciduous central incisor crypts—superiorly in the lower third of the nasal cavity, posteriorly several cm. behind the palatine papilla. They were cut in serial section—two in frontal, two in sagittal, six in horizontal, directions. Staining was with hematoxylin and eosin. Naso-palatine canal and duct were present in all specimens. In no instance was continuous passage found between nasal and oral cavities. The canal follows the course of the primitive choanas. As maxillary process anteriorly and palatine process posteriorly fuse with medial nasal process, there is formed the anlage of this structure. Prevailing opinion favors the concept that this union includes a cord of epithelial cells which undergoes central degeneration, forming a tubular structure that in some adult mammals exists as a patent communication between mouth and nose. From the inferior extremity of the bilateral canals at either side of the incisal papilla—upward, backward, and slightly lateral to a point where the most inferior portion of the nasal cavity dips down to meet it—there are remains of this epithelial cord; in many specimens it appears as a tubular structure. In lower levels these remains frequently resemble cross sections of epithelial pearls, but do not possess the characteristic onion-skin laminations. Not infrequently there is central degeneration, often cyst formation. The glands situated throughout the canal,

[4] A microscopic study of a naso-palatine duct and Jacobson's organ from tissues obtained at necropsy from ten infants who died within the first month after birth. The author is indebted to the Pathological and Pediatric Departments of the Presbyterian Hospital and Rush Medical College, Chicago, for the material obtained; to the Histological Department, College of Dentistry, University of Illinois, for preparation of sections; and particularly to Drs. F. B. Noyes and I. Schour for helpful comment and suggestion.

which open into this tubular structure, suggest the mechanism for formation of retention cysts; it is probable that many median maxillary cysts in children and adults arise in this way. As a rule, in these sections and in those of twelve infants in which the labial frenum was studied, there was a third and somewhat similar structure, which for a very short distance in lower levels lies in the midplane, beginning lower and often continuing a short way (seldom more than 2 mm. in its entire length) between the naso-palatine ducts. The diameter of this cord is greater than those previously described, but its epithelium is similar in the corresponding level. No glands have been found opening into it, nor have these specimens revealed evidence of cystic degeneration. *Jacobson's organ* could be demonstrated in both blocks in frontal section. One clearly showed bilateral indentation of the lateral wall of the nasal septum in a plane anterior to the incisor teeth. This pit became deeper and closed to form a tube and lumen that gradually diminished in size; it finally disappeared as the sections progressed posteriorly. The entire length was not more than 2.5 mm. The other block was not cut far enough anterior to enter the ventral extremity, but showed the organ bilaterally, one side being better developed than the other. Glands similar to those of the nasal mucosa opened into the lumen of the tube in both specimens.

3. MICROHARDNESS STUDIES OF DENTINE. *Harold C. Hodge, B.S., M.S., Ph.D., Senior Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* Average microhardness-measurements were made on dentine of 104 teeth; for crown on 67 teeth; for crown and root, separately, of 28 teeth; and for crown and root, together, of 35 teeth. Average microhardnesses: crown, 131; crown, 129, root, 114; crown and root, 111. Although many teeth have roots harder than the crowns of other teeth, in the same tooth the crown is always harder than the root—on the average, 14 units harder. The distribution of average microhardness is fairly well grouped about 130, and ranges from about 90 to about 170—a spread of nearly 100 percent. Vertical polarized light is a valuable aid in identifying areas of transparent dentine at higher magnifications. Significant lessening of microhardness is found after the tooth slabs are ground plano-parallel (for roentgenodensitometric study); apparent softening is attributed to the condition of the surface.

4. GROWTH CHANGES IN ANTERIOR PORTION OF HUMAN MANDIBLE INTERPRETED FROM HISTOLOGIC SECTIONS THROUGH LOWER CENTRAL INCISORS.[5] *Francis M. Yager, D.D.S., Dental School, Loyola University, Chicago, Ill.* (*1*) First evidence of a primitive alveolus for the permanent incisor germ appears at six months. (*2*) Root resorption is evident in a deciduous tooth 1.5 year old. The relationship of the permanent germ to the deciduous root plays some part in the resorptive process. (*3*) From birth to 4.5 years, the average distance from Hertwig's sheath of the *deciduous* incisor to the lower border of the mandible *increases*. (*4*) From birth to 8 years, the average distance from Hertwig's sheath of the *permanent* incisor to the lower border of the mandible *decreases*. (*5*) While Hertwig's sheath is the fixed point during some stages of development, as pointed out by Orban, there are other stages during which it grows *into* the underlying jaw tissue, as shown in Broadbent's animated picture from roentgenograms.

5. OBSERVATIONS ON RELATIVE SIZES OF NERVE FIBERS OF PULP AND PERIDENTAL TISSUES AND THEIR PROBABLE SIGNIFICANCE. *Alton D. Brashear, A.B., D.D.S., Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* Histological analysis of maxillary and inferior alveolar branches of the trigeminal nerve (cat) reveals that 44 percent of the nerve fibers are unmyelinated or small myelinated fibers less than 6 microns in diameter; 29 percent vary from 6 to 10 microns in diameter; and 27 percent are larger than 10 microns. An analysis of the stem nerve-fibers entering pulps of cat teeth show that 64 percent of the fibers are unmyelinated, or small myelinated nerve-fibers less than 6 microns in diameter. The rest of the fibers vary from 6 to 10 microns in diameter. In histological sections of peridental tissues, nerve fibers of all sizes occur, 20 to 25 percent being larger than 10 microns in diameter. A review of the literature on sensory conduction elsewhere in the body produces evidence that touch is conducted by large myelinated sensory

[5] A histologic study of growth changes in the anterior portion of the human mandible was made to determine the minute changes which occur early in life and which are not noticeable in roentgenographic interpretation. In such a study reservations must be made for the individual sizes of teeth and jaws, and consideration given to the rôle that muscles play in growth and development. The human material available made it possible to study growth changes from new-born to eight years of age, and to compare the findings with those of more advanced ages.

nerve-fibers; temperature, by those of a medium size; pain, by fibers of a fine caliber, both myelinated and unmyelinated. The author suggests that pain is the predominant, if not the only, sensation elicited from the tooth pulp; and that the peridental tissue, through its supply of nerve fibers of all sizes, becomes the organ of touch for the tooth, as well as responding to other sensations.

6. DENS IN DENTE. *T. B. Beust, M.D., D.D.S., F.A.C.D., and F. H. Freericks, Jr., D.D.S., Dental School, University of Louisville, Louisville, Ky.* Preliminary report of a tooth-like enclosure in the greatly enlarged pulp cavity of a lower second bicuspid. The inner "tooth" is composed largely of orthodentin, interspersed with strands of enamel, blood vessels, and islands of cementum-like appearance. It contains also a small enamel-lined cavity and appears to have been formed from cleavage of a part of Hertwig's sheath rather than from invagination of enamel epithelium. Examinations are being continued.

7. DENS IN DENTE. *Paul C. Kitchin, M.S., D.D.S., College of Dentistry, Ohio State University, Columbus, Ohio.* A specimen of dens in dente, of the single coronal invagination type, is described and illustrated. The specimen, from a male patient 16 years old, was extracted because of an abscessed condition. Observations were made on the entire tooth and on a section ground to keep the enamel layer intact. The theory is supported that such malformations are the results of retardations at one or more points of growth, resulting in invagination of tooth tissues (*J. Den. Res.*, 1935, *15*, 117).

8. GOLD-DECORATED TEETH FROM PHILIPPINE ISLANDS.[6] *Leslie F. Rittershofer, D.D.S., M.S., Dental School, University of Michigan, Ann Arbor, Mich.* Severe abrasion was the rule; pyorrhetic conditions, with extreme alveolar absorption, was common; the holes, varying in size from 1 to 2.3 mm. in diameter, were rounded at the base

[6] The Philippine collections in the Museum of Anthropology at the University of Michigan contain a group 43 human teeth (all upper anteriors) having small holes (in the labial surface) into which gold discs were inserted. In 20 specimens, the gold discs are still in place; four bear gold plates attached to the surface with minute pins. These specimens were obtained in 1922–1925, by the University's expedition under Dr. Carl Guthe, in the southern half of the Philippine archipelago. They were originally associated with burials. Trade vessels found with them appear to have been made during the Sung dynasty (960–1279 A.D.).

and frequently penetrated the pulp chamber; the crowns were usually deeply stained; gingival recession was present in 20 percent; marked marginal gingivitis existed in 70 percent; occasional malocclusion and infection were present; variable amounts of salivary deposits occurred on all surfaces. Retention of odd-sized bits of gold, as found in nature in streams, was facilitated by the condition that the holes were larger at the base than at the surface. There is no evidence that these discs were for any other purpose than decoration; no disc appears where it could not be seen. In the total absence of caries, there was no need for restoration.

VI. Second Session: Afternoon, March 16; Abstracts 9–19

9. Evidence of excessive occlusal stress in periodontal tissues of human teeth. *Edgar D. Coolidge, M.S., D.D.S., Dental School, Loyola University, Chicago, Ill.* Material from seven human jaws, and articulated plaster casts and radiograms of the teeth, were studied. The ages of the individuals at the time of death varied from 11 to 55 years. The fatal diseases may have reduced resistance and recuperative power of the entire cellular mechanisms, but different degrees of functional stress on periodontal tissue would have results similar to those found for any individual. Similar conditions have been produced artificially in animals in good health. *Teeth in good alignment and occlusal relation*, and showing normal function, had uniform periodontal spaces, rather thin cementum, and strong well-defined periodontal fibers. Alveolar bone was well braced with trabeculæ of supporting bone. *One bicuspid* in good position and occlusal relation, supporting an artificial crown to which an unsupported pontic was attached, did not reveal any evidence of trauma in the periodontal tissue, although trauma might have been present as a result of the extra load carried by the root; no evidence of excessive occlusal stress was found around any of the teeth in this jaw. *Teeth abraded by occlusal wear*, but without antagonists at the time of death, had greatly thickened cementum and very narrow periodontal spaces filled with indefinite connective tissue showing very few principal fiber bundles. Alveolar bone was thin and poorly supported by bone trabeculæ. Marrow spaces were greatly enlarged and fused in many areas. These findings correspond to those reported by Gottlieb and

Orban, Kronfeld, Box, and others. Teeth upon which the occlusal forces were greater than the capacity of the tissue to support the load were surrounded by evidences of hemorrhage, necrosis, and bone resorption on the side of pressure, and a widened periodontal space. Several cases of cementum fracture, and many areas of necrosis due to pressure, were found. The most interesting case was that of a child of 11, who died of scarlet fever. The periodontal tissue of each deciduous molar, and of the four first permanent molars, had areas of necrosis in the pressure regions. These findings suggest that age is not a factor in the development of injury from excessive or abnormal occlusal stress; tissue resistance, and the recuperative power of the cells, are the greatest factors.

10. MAXILLO-PREMAXILLARY SUTURE IN RELATION TO ERUPTION OF ADJACENT TEETH. *Allan G. Brodie, D.D.S., M.S., Dental School, University of Illinois, Chicago, Ill.* Low-power microscopic examination of vertical and horizontal sections through the lateral-incisor region of the rhesus monkey reveal a curious suture arrangement during the period of deciduous dentition. The crypt of the permanent lateral incisor is completely encapsulated by fibrous tissue except on the medial aspect. Disarticulation of the premaxilla from the maxilla shows that the suture, although following a fairly straight and smooth course from the nasal notch to the diastema between lateral and canine on the surface, is markedly modified within the body of the jaw. Beginning above, the approximating surface shows marked roughening for some distance. Microscopic examination reveals this roughening as an enormous surface-increase through projections on both bones, which fit into corresponding alveoli. The arrangement of binding fibres strongly resembles that in the periodontal membrane, as pointed out by F. B. Noyes in a study on cranial sutures. An extremely rich blood-supply is derived from adjacent marrow spaces. As the level of enclosed tooth germs is reached, the surface becomes smooth and swells out into a very prominent tuberosity, which almost doubles the width of bone at this level. The maxilla at this level exhibits a deep fossa, which extends back over the deciduous canine and receives the tuberosity in the articulated state. Below the base of the tuberosity the sutural surface becomes rough and denticulated again, until it emerges onto the surface in the diastema. The fact that great width-

increases take place between the canines during growth, and the close proximity of the lateral incisors to this suture, indicate that the maxillo-premaxillary suture may be a mechanism concerned with growth adjustment and eruption of the teeth of the premaxillary segment.

11. DEMONSTRATION OF 16-MICRA RHYTHM IN NORMAL STRATIFICATION OF ENAMEL AND DENTIN IN MAN AND OTHER MAMMALS. *Isaac Schour, B.S., D.D.S., M.S., Ph.D., and M. M. Hoffman, College of Dentistry, University of Illinois, Chicago, Ill.* Width of the pairs of light and dark incremental layers that normally constitute the stratification of enamel and dentin, and which include the bands of Retzius and Owen's lines of contour, was measured in various tooth-types in opossum, rat, ground squirrel, guinea pig, rabbit, cat, dog, Macacus rhesus, and man. A total of 3999 micrometer measurements were made from ground and decalcified sections of 127 teeth from control animals of various colonies, and from extraction offices located in different parts of the country; 1790 of the measurements were for human teeth. The mean value per pair of light and dark layers, for the entire group of teeth, approximated 16 micra, with a small deviation and probable error; 86 percent of the measurements fall between 15 and 17 micra; 64 percent, between 15.5 and 16.5 micra. The range of measurements is indicated in *fig. 1*. There was no significant difference, in the width of the incremental pattern, between enamel and dentin; between teeth of limited or continuous growth; between incisors, cuspids, or molars; nor between the teeth of the above-named species. (*See* abstracts 12 and 118.)

12. EXPERIMENTAL DEMONSTRATION OF DAILY APPOSITION OF 16-MICRA OF ENAMEL AND DENTIN IN GROWING MAMMALIAN TEETH. *Isaac Schour, B.S., D.D.S., M.S., Ph.D., and M. M. Hoffman, College of Dentistry, University of Illinois, Chicago, Ill.* Eighty-five injections of sodium fluoride were made, at intervals of 48–96 hours, in 8 rats, 2 ground squirrels, 4 guinea pigs, 3 rabbits, 2 kittens, and 2 pups. The number of injections varied from 2 to 8; the dosage, from 0.15–0.8 cc. of 1–4 percent NaF. Ground and decalcified sections of continuously growing incisors and molars, and of teeth of limited growth, were studied. Each injection produced a prompt record in the form of an undercalcified layer in the portion of the dentin or enamel that was then being apposed. By measuring in micra the distance between

the results of two successive injections, and dividing by number of hours in the interval, the rate of apposition per hour was obtained; the amount in enamel and dentin in 24 hours, in growing teeth, was approximately 16 micra (*table 1*); the range was 15.2–16.9 micra. There was no significant difference in results for the various species; in continuously growing incisors and molars; nor in teeth of limited

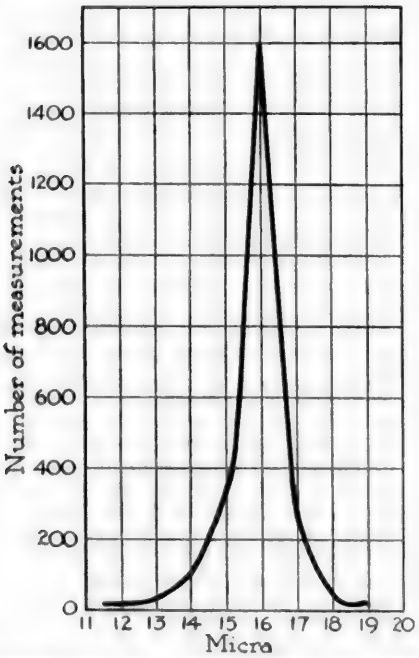


Fig. 1. Graph showing range of 3999 measurements of incremental stratification in enamel and dentin.

growth. The finding that 16 micra represent the amount of daily apposition of enamel and dentin indicates that the 16-micra rhythm observed in the normal incremental stratification is a 24-hour phenomenon. (*See* abstracts 11 and 118.)

13. COMPARISON OF EXAMINATIONS OF TEETH BY BACTERIOLOGICAL METHODS, X-RAY AND TRANSILLUMINATION. *F. Jiminez, D.D.S., Dental School, Northwestern University, Chicago, Ill.* Teeth before

extraction were examined by transillumination, and x-rays taken; after extraction, were taken to the laboratory wrapped in sterile gauze.

TABLE 1

*History of twenty-two fluorine injected animals and amount of daily apposition in enamel and dentin*

| SPECIES | ANIMAL NO. | INJECTIONS OF SODIUM FLUORIDE | | | WIDTH IN MICRA OF PAIRS OF LIGHT AND DARK INCREMENTAL LAYERS, PER 24-HOURS | |
|---|---|---|---|---|---|---|
| | | No. | Approximate dosage in mgms. per kgm. of animal per day | Time between injections in hours | Enamel | Dentin |
| Albino rat | 1 | 1 | 125.0 | Died soon after injection | ... | ... |
| | 2 | 6 | 7.6–30.2 | 72–48–48–72–48 | 16.37 | 16.14 |
| | 3 | 1 | 50.7 | Died after injection | | |
| | 4 | 3 | 29.6 | 48–48 | | 16.13 |
| | 5 | 3 | 40.9 | 48–48 | 15.87 | 16.48 |
| | 6 | 8 | 9.8–38.8 | 48–48–48–72–48–48–72 | 16.13 | 15.96 |
| | 7 | 4 | 10 | 72–48–48 | 15.70 | 16.04 |
| | 8 | 4 | 8.2–32.8 | 72–48–48 | 15.96 | 16.02 |
| Guinea pig | 1 | 3 | 6.9–27.6 | 48–48 | ... | 16.18 |
| | 2 | 7 | 24.6 | 48–48–48–72–168–48 | ... | 15.66 |
| | 3 | 4 | 26.1 | 48–48–72 | ... | 15.20 |
| | 4 | 2 | (Pregnant) | 96 | ... | 16.90 |
| Rabbit | 1 | 6 | 2.25–4.5 | 48–48–72–168–48 | ... | 16.13 |
| | 2 | 6 | 2.25–4.5 | 48–48–72–168–48 | ... | 16.19 |
| | 3 | 4 | 4.5 | 48–48–72 | ... | 16.57 |
| Ground squirrel | 2 | 3 | 46.5 | 52–48 | ... | 15.87 |
| | 3 | 3 | 47.4 | 52–48 | ... | 15.51 |
| Cat | 2 | 4 | 2.7–6.8 | 72–48–48 | ... | 16.02 |
| | 3 | 4 | 2.9–7.3 | 72–48–48 | ... | 16.00 |
| Dog | 1 | 6 | 1.8–4.5 | 48–72–72–72–96 | 15.88 | 15.85 |
| | 2 | 3 | 2.7–2.5 | 72–72 | 15.88 | 16.06 |

Cultures were made by scraping material from the outside of roots, or from root canals after dipping the teeth in alcohol and burning it off.

All *cultures* by the first method were positive; by the second, 20 were positive, 25 were negative. *X-ray:* positive, 28; negative, 17. *Transillumination:* positive, 29; negative, 16. *X-ray and bacteriological examinations* in agreement, 23. *Transillumination and bacteriological examinations* in agreement, 28. *Bacteriological examinations positive:* x-ray negative, 6; transillumination negative, 9. *Bacteriological examinations negative:* x-ray positive, 13; transillumination positive, 7.

14. FACIAL TYPES AND ENVIRONMENTAL FACTORS AMONG MIXE INDIANS OF MEXICO.[1] *Harry B. Wright, D.D.S., Philadelphia, Pa.* (*Auspices of the Mexican Government.*) Mixes are short, strongly built; have dark copper-brown skin, black straight to wavy hair. The widest part of the face is at the malar line; eyes are seldom oblique; lips are thick and protruding; mouth is seldom closed. Facial and cephalic indices are practically the same as those compiled by Starr in 1895. Two hundred individuals were examined—120 males, 80 females; ages, 12 to 90. *Findings:* one case of mal-occlusion; considerable attrition in all cases; only 27 carious cavities; missing teeth only in class who carry produce to markets and villages, and have teeth extracted by itinerant dentists. Meat or fish seldom eaten, diet consisting of maize grain, native fruits, herbs, vegetables, cheese, milk, tortillas, and chilli with every meal; intoxicants consumed only on fiesta and celebration days. Families large; infant mortality high; life-span averages 75 to 90. Pathology: dysentery, small pox, malaria, several types of venereal diseases, and "chamax," resembling yaws. Medicine men practise with magic, charms, blood letting, steam baths, and herb therapy.

15. COMPOSITION OF WHOLE SOUND TEETH, ENAMEL, AND DENTIN. *P. J. Brekhus, B.A., D.D.S., F.A.C.D., and W. D. Armstrong, Ph.D., School of Dentistry, University of Minnesota, Minneapolis, Minn.* Composition of the inorganic phase of whole teeth varies with the

[1] The Mixe Indians, one of the 23 aboriginal families of southern Mexico, reside 14,000 to 16,000 feet above sea level in Yautepec and Villa Alta, Oaxaca. They are semi-pagan; were never reduced by other tribes or Spaniards; seldom mingle or marry with other tribes; are apparently one of the last vestiges of pure strains in Mexico. They were first reported in 1729 by Padre Quintana; later by Alfonso Gay (1840); Padre Hernandez (1891), who claims "Mixes practiced cannibalism until 1830;" Dr. Frederick Starr (1895 to 1900). The author's expedition (summer of 1934) followed the route taken by Dr. Starr in 1895.

proportions of enamel and dentin. Mineral composition of enamel varies in teeth from one mouth as much as in teeth from different mouths. Composition of enamel, from the same or different mouths, is very constant. Mg and carbonate contents in dentin are higher than in enamel. The $Ca_3(PO_4)$: $CaCO_3$ ratio for enamel is twice that for dentin. Composition is correlated positively with susceptibility to decay, and age of eruption.

16. CHEMICAL NATURE OF INORGANIC PORTION OF FETAL TOOTH-SUBSTANCE. *Marian L. LeFevre, A.B., Wm. F. Bale, A.B., and Harold C. Hodge, B.S., M.S., Ph.D., Senior Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* Pooled pairs of teeth from jaws of seven term-fetuses and one seven-month fetus have been analyzed for moisture content; percentages of inorganic weight, Ca, P and Mg; and "residue solution number." Percentage of $CO_2$ was determined in teeth from three additional fetuses. Constancy of values for inorganic constituents indicates that calcification proceeds normally in the fetus. Fetal teeth, when compared with fully erupted deciduous and permanent teeth, have lower moisture contents, lower percentages of Ca and $CO_2$, and lower Ca: P ratios, indicating that the principal inorganic material in fetal teeth is different from that of adult teeth. Roentgen-ray diffraction patterns of the two materials are, however, identical. (To be published in *J. Den. Res.*)

17. ROENTGEN-RAY ABSORPTION PER UNIT-THICKNESS OF DENTINE. *G. Van Huysen, D.D.S., Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* By means of the densitometric roentgen-ray absorption method (Warren et al.), 109 tooth slabs were measured. The values for all absorption measurements were averaged, and divided by the thickness of the tooth slab to determine the roentgen-ray absorption per unit of thickness. For the 109 tooth slabs, the average absorption per unit-thickness of dentine of the (a) entire tooth was $0.95 \pm 0.05$ mm. Al.; (b) crown only, $0.97 \pm 0.04$ mm. Al.; and (c) root dentine, $0.93 \pm 0.04$ mm. Al.

18. EXPERIMENTAL GINGIVAL INJURIES IN DOGS. *W. G. Skillen, D.D.S., and G. R. Lundquist, D.D.S., Dental School, Northwestern University, Chicago, Ill.* These experiments were undertaken to

determine character of repair in healthy tissues, to ascertain (*a*) what might be expected in diseased tissues and (*b*) possibility of reattachment of peridental membrane and epithelium. Types of experiments: (*1*) severing of gingival tissues from tooth surface to level of bone, i.e., artificial pocket formation; (*2*) severing of gingival tissues from tooth surface to level of bone, curetment of root surface followed by use of sodium sulphide to dissolve any remaining epithelium; (*3*) typical flap operation; (*4*) typical gingivectomy. Teeth were marked and measurements taken of position of gingival crests and depth of injury. In most instances there was only partial and sometimes very little peridental-membrane reattachment. (Resorption of tooth surface was a frequent occurrence in this region.) Denuded surfaces apparently were rapidly covered with epithelium, irregular and disorganized in structure. Thus the healed pocket was usually very deep. In only very few instances did a nearly normal restoration occur. The shallowest pocket was obtained in gingivectomy. In no instance was there any indication of epithelial reattachment to enamel surface. There was, however, epithelial attachment to cementum in some cases. Various amounts of calculus were found in most pockets.

19. CAUSES OF DISCONTINUITY OF METAL IN SPRUES DURING PRESSURE-CASTING. *Raymond E. Myers, D.D.S., B.S., School of Dentistry, University of Louisville, Louisville, Ky.* In casting molten metal a certain type of defect occasionally results from failure of the metal to maintain, upon solidification, the shape of the sprue into which it is cast. This defect usually takes the form of constriction in some area of the stem, or in separation of the connection between casting proper and residue button. Since, in either case, the defect results from lack of continuity of metal in the sprue during casting, the term, *discontinuity of metal in sprues*, is suggested to indicate these casting anomalies. The *first part* of the study was based on the premise that an explanation of the causes of these casting anomalies is valid only if substantiated by laboratory tests. To this end experiments showed that these defects could be produced at will with the following factors, applied either separately or in combination: (*1*) insufficient pressure to complete casting; (*2*) insufficient heating of casting metal, allowing residue button to solidify before pattern chamber and sprue are filled; and (*3*) insufficient amount of surplus metal to keep sprue

filled during casting operation. The *second part* embraced a hypothetical explanation of these casting anomalies in terms of behavior of molten metal arising from the operative causes described. (To be published in *J. Amer. Den. Assoc.*)

VII. THIRD SESSION: EVENING, MARCH 16; ABSTRACTS 20–29

20. FUSIFORM BACILLUS. *Theodore B. Beust, M.D., D.D.S., F.A.C.D., Dental School, University of Louisville, Louisville, Ky.* Descriptions of these oral inhabitants have been based on inadequately stained preparations. As a result, confusion exists concerning their morphology, cytoplasmic contents, and reaction to reagents. Photomicrographs offered to support claims of successful culture bear no resemblance to the organisms that occur in the mouth. Studies of forms, flagellation, metachromism, tinctorial behavior, and developmental history, indicate that Bac. fusiformis associated with Vincent infection has not yet been artificially cultivated.

21. ISOLATION AND CULTIVATION OF FUSIFORM BACILLI AND INJECTION INTO EXPERIMENTAL ANIMALS. *Rosemary Cartmell, B.A., Department of Bacteriology, Ohio State University, Columbus, Ohio. Method of isolation and cultivation:* (*1*) Source of material: Dental Clinic, Ohio State University. (*2*) Swab gingival crevice, and inoculate potato-extract-gentian-violet broth of Slanetz. (*3*) Incubate 48 hours; plate out on North's medium, to each 100 cc. of which add 2 cc. of 1:100,000 gentian violet. (*4*) Evacuate by vacuum pump; add 2 percent $CO_2$. (*5*) Expediency: successful isolations made from eight cases. In these cultures no true spirals seen, but fusiform bacilli with one or two curves, that might be called spirals, noted. *Animal inoculation:* (*1*) Isolations on slopes of North's medium. (*2*) Polyvalent suspension of different strains in sterile saline. (*3*) Inoculations into 2 rabbits, 2 guinea pigs, and 2 rats: intra-ocular; into traumatized inguinal region, gingival crevices; intraperitoneal; into feet; intravenous. (*4*) Results: (*a*) Rabbits—multiplication of fusiform bacilli only in eyes; recovery. (*b*) Guinea pigs—necrotic abscesses in inguinal region only; death. (*c*) Rats—one died of necrosis and abscess of lungs and liver; another developed Vincent-like infection in jaw and died. Material from these rats, injected into other rats, produced similar picture. Re-isolation of pure culture of fusiform bacilli

successful. *Blood picture:* (*1*) Gradual but definite decrease in red blood-cells after slight initial increase. (*2*) Appearance of atypical neutrophilic polymorphonuclear leucocytes, and (*3*) definite increase in monocytes, just before death. All rats showed similar blood pictures. *Summary:* (*1*) Isolation and cultivation of fusiform bacilli successful in gentian-violet-potato-extract broth and North's medium. (*2*) Typical Vincent-like abscesses produced in rats, with definite increase in fusiform bacilli. (*3*) Definite change in blood picture—appearance of atypical polymorphs, and increase in monocytes. (*4*) Fusiform bacilli *resembling* spirals seen; no evidence of true spirals.

22. ACID PRODUCTION BY FUSIFORM BACTERIA. *Maynard K. Hine, D.D.S., M.S., Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* Degree of acidity produced by 23 strains of fusiform bacteria was measured in Douglas broth to which glucose had been added (2 percent). Colorimetric estimations of H-ion concentration were made after 3, 6, 9, 12, and 15 days of incubation; in 3 instances, total titratable acidity was determined at the end of the incubation period. Of these strains, 22 depressed the pH to 6.0 or below; 14, to 5.0 or below. An average of 2.4 cc. of *N* NaOH was required to neutralize the acid formed in 100 cc. of medium. Certain strains, otherwise indistinguishable, could be differentiated on the basis of final degree of acidity.

23. MOTILITY OF FUSIFORM BACTERIA. *Maynard K. Hine, D.D.S., M.S., Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* In addition to the dark-field method of examination, and flagella stains of fresh preparations and cultures, a cultural method was used to study motility of fusiform bacteria—a modification of that reported by Tittsler (*J. Bact.*, 1935, *29*, 15) for macroscopic observations of bacterial motility. Stab inoculations of 17 strains were made in 0.35 percent agar prepared from Douglas broth to which 20 percent of ascitic fluid had been added. Macroscopic observations of fresh preparations gave only inconclusive results. Flagella stains failed to reveal flagella. The cultural method showed absence of motility in sixty-eight tests with 16 strains of organisms; 1 strain, a large type, consistently gave a spreading type of growth suggestive of motility.

24. EFFECTS OF VARIATION IN MANIPULATION ON DIMENSIONAL

CHANGES AND FLOW OF AMALGAMS. *Marcus L. Ward, D.D.Sc., F.A.C.D., and Erman O. Scott, M.S., School of Dentistry, University of Michigan, Ann Arbor, Mich.* In our previous study (*J. Den. Res.*, 1931; *J. Amer. Den. Assoc.*, 1932) we found that overwork in effecting a combination of alloy and mercury, and variations in mercury content, influenced volume change. While we had supplies of alloys used in the previous study we tested effects, upon volume-change, of allowing the mulled mass of mercury and alloy to lie for five minutes before packing. Graphs showing volume-change, under normal conditions of manipulation, have curves of the same shape as those obtained with these alloys in our previous study; but also show that, if the mass is allowed to lie, the amount of retained mercury is increased when packing takes place. This retention of mercury produced essentially the same result upon volume-change as that shown in our previous study when no mercury was removed during mulling. On account of elimination of the crushing test from the specifications, and increased interest in flow, we tested effects of variations in mercury content upon flow. We found that when packing pressure was high, mercury content was low and the flow was low; when the packing pressure was low, mercury content was high and flow was high. With an alloy chosen from the accredited list we were able to produce variations of from 1.12 percent to 10.17 in flow, when pressures in packing were varied between jaring into the mold and 80 pounds on a 2-mm. plugger.

25. METHOD FOR ESTIMATING BACTERIAL CONTENT OF MOUTH BY DIRECT COUNT. *Mary C. Crowley, M.S., and U. G. Rickert, M.S., D.D.S., School of Dentistry, University of Michigan, Ann Arbor, Mich.* Material was obtained by brushing the teeth and then rinsing the mouth. No food was taken during an 8-hour period, which was started two hours before the first count, after which counts were made at 3- and 6-hour intervals. The method was similar to that used by Breed and Brew for direct bacterial counts in milk, with the exception that an atomizer was devised to break up clumps of bacteria. Dilute NaOH was used to dissolve mucin, one of the causes of clumping. The atomizer, attached to compressed air, forced a constant stream of fluid through a 100-mesh copper screen. Mouth washings were sprayed for one-half hour. The difference between counts of two

preparations from each of thirty-four samples averaged 13 percent. Counts showed variations at different times of the day, and on different days. No "diurnal tide" was observed.

26. METHOD FOR ESTIMATING BACTERIAL FLORA OF MOUTH. *Basil G. Bibby, B.D.S., Senior Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* The value of a simple method for estimating percentage distribution of different types of bacteria in various oral locations is obvious. Such a method, which avoids uncertainty of procedures depending on selective action of culture media, is presented. Materials to be examined are mixed with a suitable diluent, such as diluted broth, and shaken in a tube with glass beads until homogeneous suspension results. Four smears are prepared by spreading 0.2 cc. on each of four slides, which, after drying in the air at room temperature, are stained with iodine and by the methods of Gram, Ljubinsky, and Fontana. In the slide stained by Gram's method, the percentage of each of nine morphological "groups" of Gram-positive and Gram-negative organisms is determined. Ljubinsky and iodine stains show percentage of various filamentous types. Fontana stain gives percentages of different types of spirochetes and their relative proportions to other forms. In these examinations, fields are chosen which are representative of the distribution of bacteria on the slide, and counts of eight or nine of the fields are made until the total number of organisms counted is 250. Percentage distributions are then calculated. Duplicate counting of Gram-stained preparations has shown that results can be reproduced with an average difference of not more than about 1 or 2 percent, and a probable error of from 2 to 3 percent.

27. BACTERIAL FLORA IN DIFFERENT PARTS OF MOUTH. *Basil G. Bibby, B.D.S., Senior Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* In this procedure, differentiation is based on morphological appearance of organisms in stained preparations. Percentage distribution of different types of bacteria, in materials obtained from various locations in the mouths of twenty-eight individuals, has been studied by a method previously described (Bibby, 1935). Specimens were collected after repeated rinsing of the mouth to exclude bacteria from other areas. Materials for examination were taken from gingival crevices, occlusal

fissures, buccal enamel-surfaces of lower molars, enamel surfaces at orifices of salivary ducts, posterior surfaces of last lower molars, mucous films from lower molars, buccal mucosa, and mouth washings. *Findings*: (*1*) appreciable percentages (13–17 percent) of Gram-negative filaments in materials from gingival crevices, occlusal fissures, enamel surfaces at duct orifices, and posterior surfaces of lower molars; (*2*) low percentage (2.5) of such filaments on buccal mucosa; (*3*) excess (11 and 12 percent) of Gram-negative over Gram-positive cocci in occlusal fissures and on enamel surfaces at duct orifices; and (*4*) high percentage (60) of Gram-positive cocci on buccal mucosa. The necessity for further improvement in technique, especially in taking samples, is appreciated; investigations in this direction are being carried forward.

28. MOUTH ORGANISMS RESEMBLING ACTINOMYCES. *Basil G. Bibby, B.D.S., Senior Rockefeller Fellow in Dentistry, and Holmes T. Knighton, D.D.S., Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* Only three strains of true actinomyces, possibly contaminants, were obtained, on Naeslund's saliva agar and other media, from ten series of inoculations of calculus and mouth scrapings. In another series of observations, actinomyces-like organisms were found in all plates inoculated with mouth rinsings from nine mouths, and in thirteen of a series of seventeen inoculations with mouth scrapings. Only a few anaerobic types were found, the aerobic types being much more common. Subculture was not achieved with anaerobic types, but forty strains of aerobic forms grew readily on artificial media. In morphology, these types were very irregular, varying in shape from cocci to branched bacilli or filaments with clubbed ends. In unfavorable media, coccal forms predominated. Most strains were Gram-positive, but some were decolorized readily except for granules and clubs. All strains fermented glucose, levulose, maltose, and sucrose—a few lactose or salicin—producing, in 2 percent glucose solutions, pH values between 4.6 and 5.8. None liquefied gelatin or produced indol, but reduction of nitrate was not uncommon. We have not found descriptions of such organisms as these. They resemble Kligler's *Cladothrix placoides*, and certain of the Corynebacteria, and appear to fall into certain classifications of the true actinomyces.

29. STUDIES OF DENTAL-CARIES INCIDENCE IN RELATION TO NUTRITION IN EIGHT ARCHIPELAGOS OF PACIFIC OCEAN. *Weston A. Price, D.D.S., M.S., F.A.C.D., Dental Research Laboratory, Cleveland, Ohio.* In further consideration of the problem, "Why dental caries with modern civilization," studies have been continued on primitive racial stocks at the point of contact with modern civilization, for comparison with their conditions where physical isolation still prevents them from being reached sufficiently by outside influences to modify their physical condition. The relatively primitive groups visited during June to September, 1934—on eight archipelagos of the Southern Pacific Ocean—all speak different languages and are of different racial stocks. These island groups were the Marquesas, Society, Cook, Tongan, New Caledonia, Fiji, Samoan and Hawaiian Islands. The data recorded for each individual included the foods constituting past and present nutritions, age, physical condition of teeth, physical development including facial and oral, with photographic records of large numbers of cases. Of 763 individuals living on native foods, with 22,875 teeth studied in detail, only 76 teeth (0.33 percent) had been attacked by tooth decay. Of 530 individuals living on trade foods in part or whole, with 16,811 teeth, 4,007 teeth (23.8 percent) had caries. On trade foods, increased incidence of caries was 72 fold. Expressed in terms of susceptibility, in accordance with the usual method, only 5.8 percent of individuals living exclusively or nearly so on native foods had present or past caries; of those on trade foods in whole or part, 99.2 percent had caries, past or present. These data are comparable to those previously reported for other primitive racial stocks; namely, Swiss in the Alps, Gallics in Outer Hebrides, Eskimos in Alaska, and Indians in northern and central Canada. Large numbers of samples of native foods were gathered from each of these groups and brought to the laboratory for analysis. Highly efficient native foods of the South Sea Islands consisted largely of small animal life of the sea, with land plants including some fruits. Trade foods of each group, including South Sea Islands, consisted in large part of white flour, sugar, and sweetened products.

## VIII. FOURTH SESSION: MORNING, MARCH 17; ABSTRACTS 30–40

30. AGE INCIDENCE OF DENTAL CARIES AND TYPES OF TREATMENT: CORRELATION OF 14,935 CASE HISTORIES. *P. J. Brekhus, B.A., D.D.S.,*

*F.A.C.D., and W. D. Armstrong, Ph.D., School of Dentistry, University of Minnesota, Minneapolis, Minn. Objectives:* general survey of relative prevalence of caries and treatment in age groups. *Method of approach:* patients classified as to age and sex. Number of teeth studied: 418,180. The condition of every tooth was recorded as to extractions; untreated caries; fillings; different types of fillings, such as gold, amalgam, silicate, and cements; percentage of failures of each type of filling material; replacements such as bridge work, and partial and full dentures, were also recorded, but mechanical replacements are not indicated here. (*a*) *Relative age incidence of dental caries:* decay of teeth most prevalent during childhood and early teens; after the 20's, immunity appears. (*b*) *Relative caries-susceptibility in different teeth:* lower six anteriors, lower first bicuspids, and upper cuspid may be classed—comparatively immune; upper centrals and laterals, upper first and second bicuspids, and lower second bicuspids—susceptible; and upper and lower molars—very susceptible. (*c*) *Increase in caries in 10–20 age-group* over older age-groups—percentage figures, relating to lower first molars, that apply to the male group:

| *Age* | *10–20* | *21–30* | *31–40* | *41–50* | *51–60* | *61+* |
|---|---|---|---|---|---|---|
| Caries | 97 | 90 | 83 | 77 | 83 | 84 |
| Immune | 3 | 10 | 17 | 23 | 17 | 16 |

The relationship in right and left molar regions in both sexes is the same. *Those who knew not of preventive dental care in the form of diet and prophylaxis had better molars than those who had the benefit of the contributions of modern dental science.*

31. MODIFIED DENTAL-CARIES INDEX. *Charles F. Bödecker, D.D.S., F.A.C.D., School of Dental and Oral Surgery, Columbia University, New York City.* Animal experimentation and human nutritional observations indicate that activity of caries is related, in an obscure manner, to dietary conditions. It has been shown that marked improvement occurs on increasing vitamin D in diets of children. Some phases of *general health* may be related to *dental health.* If this be true, then charting the activity of caries should be of increasing value. Since records have not been standardized, it is impossible to compare dental charts of different examiners on the basis of a common denominator. The time is ripe, therefore, to systematize records, so that

the condition of the teeth of one person can be compared with that of the average condition for the same age and sex. The modified caries-index employs as a unit of calculation the number of carious *tooth surfaces*. Thus the size of each cavity is evaluated by the extent of tooth involvement. A chart has been prepared for distribution in which the caries-susceptible areas of each tooth are indicated on geometric tooth-symbols. The average caries-indices for five-year groups, based on 3871 mouth examinations of males and females ranging in age from 5 to 40 years, are shown in a graph. These fragmentary results are published in the hope of stimulating dentists to chart the teeth of their patients methodically, so that more exact averages may be obtained for each year- and sex-group. Such figures would do much to clear our present hazy conception of the varying activity of caries under different conditions of age, sex, occupation, nationality, and climate, and would facilitate comparison of dental conditions of people living under civilized surroundings with those having a primitive mode of life. (To be published in *J. Den. Res.*)

32. FREQUENCY OF UNILATERAL DENTAL CARIES IN 350 CASES. *Charles F. Bödecker, D.D.S., F.A.C.D., and Sol Ewen, B.S., School of Dental and Oral Surgery, Columbia University, New York City.* Caries sometimes attacks the approximal surface of one tooth while a contacting neighbor is unaffected; this condition is designated *unilateral dental caries*. It was found for 60 teeth in 363 full-mouth x-rays selected at random. Analysis of the varied probable causes of unilateral caries shows that these fall naturally into two main groups: (*1*) *Variation in environment of single teeth*—(*a*) Bacterial plaque attached to affected tooth. (*b*) Retention of carious deciduous tooth, causing adjacent permanent tooth to be affected. (*c*) Protection afforded one tooth by orthodontic band. (*2*) *Variation in resistance of individual teeth*—(*a*) Anatomical form, (*b*) calcification, (*c*) structure. Caries affecting only one of two closely adjoining teeth indicates that food retention, bacteria, and saliva cannot be the only factors in dental destruction. Some cases of this kind can be explained on the basis of change in environment; the rest indicate that teeth themselves have a variable resistance to attack. Superior lateral incisors seem to be most prone to unilateral caries. The principal factors affecting resistance of single teeth seem to be variations in calcifica-

tion, and anatomical and structural differences. Therefore, the etiology of dental caries seems to include not only food retention, bacteria, and possibly changes in salivary content, but also variation in resistance of individual teeth. (To be published in *J. Den. Res.*)

33. EFFECTS OF EPINEPHRINE UPON PROCAINE TOXICITY. *Earl A. Zaus, B.S., M.D., and L. W. Moody, B.S., Northwestern University Dental School, Chicago, Ill.* Eggleston and Hatcher have shown that epinephrine reduces the toxicity of procaine when given either subcutaneously or intravenously. More recently, Knoefel reported a slight increase in toxicity. Both groups of workers used rapid, single-dose, injections intravenously. Intravenous injection at a slow but constant rate, by the method of MacDonald and Israels, in 11 cats, yielded the following results: in 3 there was no definite effect upon procaine toxicity; in 8, epinephrine reduced toxicity 18–57 percent—average, around 35. It is possible that this epinephrine-effect was due to better circulation through the medullary centers, or that rate of hepatic destruction of procaine was hastened. The latter appears to be the probable mechanism. Our results indicate that epinephrine cannot be blamed for the occasional reactions in patients following infiltration anesthesia. Patients suffering from toxic thyroid, or hypertension, or having a coronary-myocardial syndrome (angina, etc.) may be exceptions.

34. AMMONIA CONTENT OF SALIVA IN RELATION TO DENTAL CARIES. *Julius White, Ph.D., and R. W. Bunting, D.D.S., F.A.C.D., School of Dentistry, University of Michigan, Ann Arbor, Mich.* An attempt to verify findings recently published by Grove and Grove (*J. Amer. Den. Assoc.*, 1935, *22*, 247; *Den. Cosmos*, 1934, *76*, 1069), who stated that salivary ammonia is consistently higher in caries-free individuals and that it acts as a solvent for bacterial plaques, thus retarding caries. (See succeeding abstract.) We found that by using the permutit method employed by Grove and Grove we were unable to determine with any degree of accuracy the resultant colorimetric values for salivary ammonia. The data here reported were obtained by a modification of the aeration method of Folin, which was carefully checked and found accurate for salivary ammonia. The analyses were made on stimulated salivas of 37 well-selected caries-susceptible and caries-free individuals varying in age from 9 to 40 years. The results

showed considerable variation, but no relationship between salivary ammonia and pH, and degree of caries activity. These studies very definitely failed to corroborate the findings of Grove and Grove—(*see* succeeding abstract. Published in *J. Amer. Dent. Assoc.*, 1935, *22*, 468; March.)

35. AMMONIUM CONTENT OF SALIVA. *Carl T. Grove, D.D.S., and Carl J. Grove, Ph.G., D.D.S., F.A.C.D., St. Paul, Minn.* In salivary analysis for about 150 caries-immune and caries-susceptible cases, it was found that the ammonium content was decidedly higher in caries-immune individuals than in caries-susceptibles. Ammonium content in saliva from caries-susceptible mouths varied from nil to 6 or 7 mgms. per 100 cc.; in saliva from caries-immune mouths, from 8 to 20 mgms. per 100 cc. We therefore believe that the ammonium content of saliva is an indication of susceptibility or immunity, and that sufficient salivary ammonia exerts a favorable influence. Recently White and Bunting (see preceding abstract) were unable to confirm this correlation, but the method they employed was of another principle—we have since used it with results similar to theirs. The procedure we employed in our investigations is the permutit method (Folin and Bell), in which ammonium is absorbed by permutit powder; then released by NaOH; and the solution Nesslerized and compared in a colorimeter with a standard nitrogen solution similarly treated. An aeration method was used by White and Bunting, in which saliva was treated with saturated solution of $Na_2CO_3$, releasing and blowing ammonia into a tube of standard acid, and estimating by titration. The gross difference in the findings by the two methods indicates that they do not reveal the same product, yet both methods are for the determination of ammonia. Because of the high protein content of saliva, the permutit method may estimate nitrogen other than that of ammonia. The fact remains, however, that the results obtained in analysis of saliva of caries-immune and caries-susceptible persons, by the permutit method, are very significant, and show higher values for a nitrogenous product in saliva of caries-immune mouths. The exact chemical character of this substance requires further investigation, which we are now conducting.

36. RAT SUSCEPTIBILITY TO DENTAL CARIES. V: INFLUENCE OF CA, P, VITAMIN D AND CORN OIL. *Theodor Rosebury, D.D.S., and*

*Maxwell Karshan, Ph.D., Medical and Dental Schools, Columbia University, New York City.* Rats in sixteen groups, each of 10–13 animals, weaned at 22 days from McCollum-stock-diet mothers, were given respectively 10-mesh rice-dextrin-spinach low-Ca caries-producing ration, or the same modified or supplemented with (*a*) 100-mesh rice in place of 10-mesh; (*b*) high-Ca (Ca:P = 6.9); (*c*) same, with 100-mesh rice in place of 10-mesh; (*d*) Ca to Ca:P = 0.5; (*e*) 7 percent of protein (wheat gluten); (*f*) Ca and P at high levels, Ca:P = 1.53; (*g*) same, with 2 percent of cod-liver oil; (*h*) 2 percent of cod-liver oil only; (*i*) 5 percent of cod-liver oil; (*j*) viosterol in corn-oil equivalent, in vitamin-D and fat contents, to 2 percent of cod-liver oil; (*k*) same, but equivalent to 5 percent of cod-liver oil; (*l*) 2 percent of corn oil; (*m*) 5 percent of corn oil; (*n*) basal diet alone, and animals irradiated with ultraviolet rays in apparently optimal dosage. Feeding periods ranged from 45 to 181 days. Identification and rating of caries, from decalcified micro-sections of all animals, were made by the method previously described (*J. Amer. Den. Assoc.*, 1934, *21*, 1599). Blood of animals in all groups was analyzed for Ca and P. *Results:* (*1*) Caries was produced with coarse-rice basal-diet either of high-Ca deficient type or of low-Ca type; the former was not more effective than the latter. (*2*) On both types of deficient diet, incidence of caries became zero when the rice was 100-mesh, although characteristic deficiencies were unabated. (*3*) Addition to basal diet of cod-liver oil (2 percent) —or viosterol in corn-oil equivalent, in vitamin-D and fat contents, to cod-liver oil (2 percent)—induced definite reduction in caries, but did not completely prevent it. Protective effect was not significantly augmented by increasing vitamin D and fat dosage to 5 percent of cod-liver oil or its viosterol-corn-oil equivalent, nor by further addition of Ca and P to normal ratio and at high levels. (*4*) Irradiation with ultraviolet rays of rats on basal diet was less effective in reducing caries than vitamin-D-oil-feeding, but this result was inconclusive. (*5*) Addition to basal diet of corn oil (2 or 5 percent), which did not remedy dietary deficiencies, caused significant reduction in caries, not distinguishable from that induced by vitamin D in oil. Part at least of the protective effect of vitamin-D-oil preparations thus seems to have been contributed by vitamin-free oil. (*6*) Within groups that received diets with adequate or nearly adequate calcifying

properties, individual variation in incidence of caries was unrelated to blood levels of Ca or P. Degree of protective effect against caries of diets supplemented with calcifying agents was also not related to degree of calcifying action. Protective influence of calcifying foods against caries may be independent of calcification mechanisms, and possibly of metabolic influences generally.

37. RAT SUSCEPTIBILITY TO DENTAL CARIES. VI: INFLUENCE OF ORANGE JUICE AND DIETARY ACID-BASE BALANCE. *Theodor Rosebury, D.D.S., and Maxwell Karshan, Ph.D., Medical and Dental Schools, Columbia University, New York City.* Rats in six groups, each of 10–12 animals, weaned at 22 days from McCollum-stock-diet mothers, were given respectively 10-mesh rice-dextrin-spinach caries-producing ration, or the same modified or supplemented with (*a*) orange-lemon juice (12 + 1) *ad lib.* in place of water; (*b*) synthetic-citrate mixture, with acid-base properties and sugar content of natural citrus-juice *ad lib.* in place of water; (*c*) similar citrate mixture, with acid-base properties, sugar, and salt content of natural citrus-juice *ad lib.* in place of water; (*d*) all rice replaced by 10-mesh dry lima-bean; and (*e*) part of rice replaced by lima bean. Periods of feeding ranged from 50–130 days. Acid-base properties of diets, calculated from food and fluid intake levels, indicate that all were definitely alkaline except the basal, which was approximately neutral. Tests for pH and $CO_2$-content of plasma, and pH of urine, yielded values within normal range. Identification and rating of caries, from decalcified microsections of all animals, were done by the method previously described (*J. Amer. Den. Assoc.*, 1934, *21*, 1599). *Results:* (*1*) Orange-lemon juice *ad lib.* in place of water with a 10-mesh rice caries-producing diet did not reduce incidence of caries, but resulted in increase of doubtful significance. This was duplicated in less degree in groups on synthetic-citrate mixtures. Observed increase of caries may have depended on fermentable sugar in these fluids. (*2*) Alkaline-rice-lima-bean diet yielded caries incidence not significantly lower than that on basal rice-diet. Rice-free lima-bean diet did not allow survival beyond 22 days of feeding, but nevertheless induced typical lesion of fissure caries in one instance, in a rat that survived only 7 days.

38. BACTERICIDAL PROPERTIES OF HUMAN SALIVA. *Walter E. Taylor, D.D.S., Rockefeller Fellow in Dentistry, and Basil G. Bibby,*

*B.D.S., Senior Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, Rochester, N. Y.* By means of a modification of Fleming's "well" technique (*Lancet*, 1924, i, 1303), thirty-five samples of human saliva were found to exert marked bactericidal and bacteriostatic effects upon *M. lysodeikticus*. Effects were more marked than those shown upon *L. acidophilus* by Clough (*J. Den. Res.*, 1934, *14*, 164). Forty-two samples of saliva from five individuals failed to show these effects upon pneumococci (Types I, II and III), hemolytic streptococci, fusiform bacteria, or influenza bacilli. In a comparative study on *M. lysodeikticus* and *L. acidophilus*, it was noted that the salivary principle that was active against the *former* organism was removed by filtration through Berkefeld N filters, even when 100 cc. were used. This "principle" was concentrated in the sediment by moderate centrifugation, and soluble in 0.9 saline; it resisted heat at 73°C. for 15 minutes; and induced lysis of organisms in liquid media. The "principle" that was active against the *latter* organism, was filterable; not concentrated by centrifugation; insoluble in saline; destroyed at 70°C. in 5 minutes; and did not produce lysis of organisms. There are apparently two different bactericidal agents in human saliva.

39. EFFECTS OF A THEORY ON MORTALITY RATE OF HUMAN TEETH. *P. J. Brekhus, B.A., D.D.S., F.A.C.D., School of Dentistry, University of Minnesota, Minneapolis, Minn.* In comparing data on loss of teeth from a survey of 9,450 patients in 1924 with data of a similar survey of 14,935 patients ten years later (1934), it is revealed that dentistry has saved from 35 to 40 percent more teeth during the past decade than during the period between 1912 and 1923. The author interprets this to be the result of a change in emphasis in dental treatment, and not to a change in prevalence and severity of dental disease. The theory of focal infection was responsible for wholesale extraction of teeth during the decade beginning 1912; but many blasted hopes and broken promises brought the swing of the pendulum to more conservative practice.

40. DENTAL-CARIES INCIDENCE IN RELATION TO NUTRITION AMONG PAST AND PRESENT INDIANS OF FLORIDA. *Weston A. Price, D.D.S., M.S., F.A.C.D., Dental Research Laboratory, Cleveland, Ohio.* In study of skeletal material in anthropological collections of several museums, opportunity was offered to note geographical location and

its influence upon nutrition in relationship to physical development of pre-Columbian residents. Presence or absence of dental caries, and of facial and dental-arch deformities, was also recorded. This material provided a control on modern inhabitants of the same districts, with particular consideration of past and present members of Indian racial stocks. The data are divided into three groups: (*1*) skeletal material as removed from mound to museum; (*2*) less modernized of present Indians residing in Everglades and Cypress Swamps; and (*3*) most modernized groups, living in close contact with modern civilization and many in concession camps along highways and near Miami. Among skulls *in museums*, practically 100-percent immunity to dental caries was found. An assistant director in charge of one of the largest collections stated that in all their skeletal material they had not found one carious tooth. That these individuals were pre-Columbian was indicated by their flexed position in the graves. In the field studies among the Seminole Indians of Florida, during January and February, 1935, no families had been completely isolated from modern civilization and its foods. In several families, however, which had been raised almost entirely on native foods, incidence of dental caries was 4 percent of the teeth. In the Indians living largely on food of modern civilization, which in the concessions was free, 40 percent of the teeth had been attacked by tooth decay. Each of these groups included children five years of age and over.

## IX. Fifth Session: Afternoon, March 17; Abstracts 41–52

41. Relation of oral infection in malignant neutropenia. *J. H. Kaiser, Ph.C., B.Sc., D.D.S., under the direction of C. A. Doan, M.D., and P. C. Kitchin, D.D.S., Ohio State University, Columbus, Ohio.* A case of malignant neutropenia with acute, fulminating oral infection as the chief presenting sign, was received at the hospital, Oct. 18, 1933. There was marked leucopenia of 1250 cells, with only 22 polymorphonuclear cells per cm. Active Vincent infection was present. Intensive neucleotide-therapy brought the leucocytes both quantitatively and qualitatively to normal limits. Improvement in mouth conditions by treatments with spirocheticide and scaling brought prompt fall of granulocytes, coincident with increase in lymphocytes, suggesting removal of a source of toxic material; also

marked rise in hemoglobin and increase in red blood-cells. The patient was dismissed Nov. 18, 1933, with normal gingivæ, excepting a swollen area over upper incisors, which soon became necrotic; after removal of three teeth and subsequent medical therapy, it failed to heal. "Heroic treatment" through a mistake by the patient finally caused the first systemic reaction, with increase in leucocytes from 5,000 to 8,000; and in polymorphonuclear cells, to 75 percent. The gingivæ returned to normal; the remainder of the teeth were removed; full dentures were made. The patient has remained in good health, with no recurrent neutropenia, for a period of seventeen months. It is believed that unhygienic condition of the mouth, especially acute Vincent infection, was responsible for the initial neutropenia.

42. IRREGULARITIES OF DENTAL ARCHES AND FACIAL FORM IN RELATION TO NUTRITION IN EIGHT ARCHIPELAGOS OF PACIFIC OCEAN. *Weston A. Price, D.D.S., M.S., F.A.C.D., Dental Research Laboratory, Cleveland, Ohio.* Studies of primitive racial stocks, as previously reported, revealed important data relating to etiology of facial deformity and irregularities of dental arches. The groups here reported were the same as those included for the dental-caries problem (abstract 29). Among the individuals (and whose parents) had lived practically entirely on native foods, there was neither facial nor dental-arch deformity or irregularity of the teeth, excepting in two individuals having supernumerary teeth in such positions as to produce slight displacement of individual permanent teeth. Among the individuals whose parents had lived on trade foods, in considerable part or in whole during their developmental and growth periods, large numbers exhibited gross irregularity of both facial features and dental arches, shown usually as lack of development forward of middle third of face; lack of development of lower third of face or a combination of these two; or narrowing of one or both arches, with crowding of teeth. In many instances both parents had relatively normal dental arches, their contact with foods of modern civilization having come after growth had been completed. Their children's formative and early-growth periods had occurred while liberally using trade foods. Irregularities often occurred in all the children in a family, as previously reported for other racial stocks, and appeared markedly in the growth period that included eruption of the second dentitions. The degree of

these deformities was often directly associated with extent of displacement of native foods by trade foods, chiefly white flour and sugar products.

43. RELATIONSHIP BETWEEN NUTRITIONAL GROWTH-DISTURBANCES AND DISEASE RESISTANCE AMONG SOUTH SEA ISLANDERS. *Weston A. Price, D.D.S., M.S., F.A.C.D., Dental Research Laboratory, Cleveland, Ohio.* These individuals were included in reports on dental caries and facial deformity in eight archipelagos of the South Sea Islands studied in 1934 (abstracts 29 and 42, respectively). It was previously reported that dental arches and facial form universally reached high states of excellence in these racial stocks when living on native foods, even though these were quite different for the various groups. Further, that this high physical perfection was lost in many individuals when native foods were displaced, during developmental and growth periods, by trade foods of modern civilization. Individuals seriously affected by degenerative processes, especially tuberculosis and arthritis, belonged chiefly to the group showing evidence of physical injury during developmental and growth periods. Thus, all of 20 boys and girls in the Juneau hospital, Alaska (summer of 1933), had marked irregularity of teeth and deformity of dental arches. Owing to scarcity of hospitals in the South Sea Islands, and to the fact that even where hospitals had been organized few patients were retained, the number of hospital cases available for study was small. Of 28 individuals in tuberculosis wards (Hilo) with lung involvement, all but two had definite irregularity of dental arches. In the Honolulu tubercular hospital, all of 18 boys and girls (pulmonary tuberculosis) had marked irregularity of dental arches; one (tubercular glands of neck) also had marked irregularity of facial development. Apparently defensive mechanisms also suffered injury.

44. CHEMICAL EXAMINATION OF DIFFERENT BRANDS OF BRILLIANT GREEN, CRYSTAL VIOLET AND GENTIAN VIOLET. *Edwin W. Shand, Ph.D., and Samuel M. Gordon, Ph.D., Bureau of Chemistry, American Dental Association, Chicago, Ill.* An attempt was made to elaborate standards for brilliant green, and crystal and gentian violet, which have been used in the practice of dentistry as bacteriostatic and antiseptic agents. Samples purchased in the open market were subjected to the following tests: color reactions, loss of weight over various

drying agents, ash, sulphated ash, heavy metals, hot-water insoluble, alcohol insoluble, total dye content, nitrogen, chlorine, sulphate, and "melting point." It was found that similar designations were used for products of somewhat different composition. This particularly applied to products sold as crystal violet and gentian violet. Impurities such as inorganic salts and organic matter were present in widely varying amounts. Accordingly, preparation of standards of identity and purity was postponed until the market supply of these dyes for medicinal use is more uniform.

45. ODONTOGENESIS IN OVARIAN TERATOMA. *H. R. Churchill, D.D.S., Dr. med. dent., Dental School, University of Pennsylvania, Philadelphia, Pa.* A case of odontogenesis in an ovarian teratoma removed from a woman; age 33. Histopathological detail pertaining to odontogenetic tissues. Tissues homologous to those of dentogingival and successional laminae of normal odontogenesis are demonstrated.

46. AMELOBLASTOMA: FOUR CASE REPORTS, AND REVIEW OF 308 CASES IN LITERATURE. *H. B. G. Robinson, D.D.S., Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* Ameloblastoma is a persistent, expansive, epithelial neoplasm in solid or cystic form, histologically resembling certain phases in development of the enamel organ. It is anatomically benign. Four case-reports: (*1*) Left mandible of 44-year old male negro; duration, 4 years; removed by resection; presents solid and cystic structure containing well-formed tooth (case of Dr. R. H. Ivy). (*2*) Right mandible of 25-year old white female; operated, four times during 4.5 years; cystic structure. (*3*) Right maxilla of 29-year old white female; duration, 1 year; solid and cystic structure, with epithelial pearls. (*4*) Right mandible of 49-year old white male; duration, 1 year; solid in structure (cases 2, 3 and 4 from Oral Surgery Clinic, Strong Memorial Hospital). A study of 308 cases in the literature (many incomplete), with the foregoing four, showed that 57.2 percent occurred in females (120 of 209); 83 percent in the mandible (186); 51 percent (78 of 152) were discovered between the 15th and 30th years—average age of discovery, 30.8 years (152 cases); average duration 8.8 years (162 cases). The reports note recurrences in 75 cases, malignancies in only 18—results that do not place amelo-

blastomata with malignant tumors. (Part of this work was completed at the School of Dentistry, University of Pennsylvania.)

47. HEALING OF EXTRACTION WOUNDS IN DOGS. *Roland S. Claflin, D.D.S., Dental School, Loyola University, Chicago, Ill.* An experimental study in treatment, in dogs, of so-called "dry socket." To determine retardation of healing in infected and treated sockets, it was necessary to establish average normal healing time. This was done by extracting teeth at short intervals over a period of 31 days; in one dog, daily for five days; in another, at three- and four-day intervals. The findings were similar to those reported by Euler and Schram. Dry sockets were produced by infecting extraction-wounds with mixed culture of streptococci and staphylococci from infected human pulp. Infected sockets were treated with empirical mixture of iodin, glycerin, phenol, and collodion; some, with individual drugs of the formula mixed with collodion. Infection of sockets resulted in necrosis and extensive bone-resorption. Sockets healed with granulation tissue and scar tissue, followed by regeneration of new bone. Treatment did not seem to influence healing.

48. PERIODONTOCLASIA, WITH SPECIAL REFERENCE TO USE OF AUTOGENOUS VACCINES AND SURGICAL INTERVENTION. *George D. Lose, D.D.S., and Jacques R. Foure, B.Sc., D.D.S., Dental School, Ohio State University, Columbus, Ohio.* Ten cases of marked periodontoclasia were selected and complete case histories obtained. Cultures of organisms (from which were made autogenous vaccines) were obtained from the four deepest pockets in each patient, and smears made to determine incidence of Vincent organisms. Then thorough subgingival curetment was begun, and all pockets measured as to depth and lateral extent. At this time autogenous-vaccine injections were started—three of 0.1 cc., and on the average at 5-day intervals; malocclusion was corrected, and diets checked and readjusted; and patients were divided into two groups. *Group 1:* received thorough subgingival curetment every 30 days on right side of mouth only, left side receiving no further treatment. At each monthly curetment all pockets were charted as to depth. *Group 2:* labial and lingual gingivae removed on right side, and only so far as attachment to alveolar process; nothing done on left side. Pockets measured as for Group 1; both groups x-rayed every sixty days. *Conclusions:* (*1*)

It is inadvisable to resort to surgical elimination of pockets in mild or advanced cases, but advisable for isolated longitudinal pockets. (*2*) In non-surgical cases (Group 1), both sides reacted equally to the two modes of treatment. (*3*) Autogenous vaccines, as treatment adjuncts in refractory cases, would accelerate recovery.

49. ANATOMIC VARIATIONS IN EDENTULOUS HUMAN MANDIBLES. *E. C. Pendleton, D.D.S., M.D.S., Dental School, Loyola University, Chicago, Ill.* Serial sections through edentulous lower human jaws showed variations in form and character of bone and soft tissues dependent upon progress of resorption in regions from which sections were obtained. Seven lower jaws from six men and one woman, aged 38 to 80, were studied. Age affects general character of both bone and soft tissues. Marrow spaces increase in size, and trabeculae become thinner, with advancing age. The cortex of the bone is correspondingly increased in density and thickness at lingual and labio-buccal surfaces. The crest of the residual alveolar ridge is reduced in size, and irregular in form. Fat tissue and loose connective tissue are more abundant in older jaws. In general, no relation has been observed between age and effects of resorption upon form and character of bone and soft tissues of the lower jaw; but there seems to be distinct relation between resorption of bone and character of soft tissues. The more extensive the progress of resorption of bone, the greater the amount of fat and loose connective tissue about the muscle fibers. In serial sections of regions showing protracted resorption of bone, labial and lingual muscles show aponeurotic attachments whereas normally their attachment is directly to bone.

50. RÔLE OF H-ION CONCENTRATION IN BUFFERED PROCAINE SOLUTIONS, WITH REFERENCE TO EFFECTS ON TISSUE REACTIONS. *Elmer J. Lawson, S.B., F. H. Borg, M.D., D.D.S., Beatrice Raymond, M.D., M.S., and J. Rice Turner,* with *Stanley W. Clark, D.D.S., LL.B., M.S.D., F.A.C.D., Dental School, Northwestern University, Chicago, Ill.* In an attempt to determine quantitatively the degree of tissue reaction to injection of buffered local anesthetic solutions, 2-percent procaine hydrochloride solutions, in buffers at pH values ranging in unit steps from 3 to 8, were employed. The buffer consisted of disodium phosphate and citric acid. Epinephrin solutions (1:30,000) were also injected. Because all buffered procaine solutions were hypertonic

except probably pH 3, controls consisting of NaCl solutions having the osmotic pressure of the buffered solutions were used. The solutions were injected into muscle of hind leg, and skin of abdomen, of white rats, which were killed after periods of 12, 24, and 72 hours, and 1 and 2 weeks. Tissues of injected areas were examined microscopically. The work was done with strict surgical asepsis. Solutions prepared in pH ranges of 3 to 8, and injected into muscle and skin, were (epinephrin solution included): (*a*) buffer solution; (*b*) buffer, epinephrin (1:30,000); (*c*) epinephrin solution (1:30,000); (*d*) buffer procaine (2 percent); (*e*) buffer procaine epinephrin; (*f*) NaCl control on osmotic pressure. Buffer efficiencies were determined by titration. Osmotic pressure of buffer procaine solution, in each pH range, was determined experimentally, so that NaCl controls of equal osmotic pressure could be prepared. *Conclusions:* (*1*) Solutions in order of ensuing irritation, from maximum to minimum: (*a*) pH 3; (*b*) epinephrin; (*c*) pH 4; (*d*) pH 5, 6, and 8; (*e*) procaine hydrochloride; (*f*) pH 7. (*2*) Effects on muscle and skin of osmotic pressure, as represented in salt concentrations of 1 to 2 percent, may be disregarded. (*3*) Effects of solution of pH 7, in inducing tissue response, may be disregarded. (*4*) Anesthetic solutions of pH 8 are generally more irritating than those of pH 7. (*5*) Epinephrin solutions (1:30,000) are highly irritating in muscle, but apparently less so in skin. (*6*) Procaine solution alone has only slight irritating effect.

51. CLEIDOCRANIAL DYSOSTOSIS. *R. G. Heupel, D.D.S., Children's Memorial Hospital and Dental School, Loyola University, Chicago, Ill.* A report of four cases in one family—father and three children—showing multiple dental and skeletal anomalies. There were supernumerary unerupted permanent incisors and bicuspids; also complete or partial failure of the whole permanent dentition to erupt. The roots of the deciduous teeth failed to resorb. The most marked skeletal defects are absence of clavicles and failure of fontanels to close. All membranous bones show marked defects; less marked defects were also noted in long bones.

52. PAGET'S DISEASE: SIGNIFICANT ORAL MANIFESTATIONS. *Thomas J. Cook, D.D.S., Dental School, University of Pennsylvania, Philadelphia, Pa.* Mrs. L. C.: about five feet tall, 132 pounds, squatty stature, tremendous head, cheek bones unusually high, maxilla tre-

mendous, bridge of nose thickened, breathing difficult. Referred by dentist who, three weeks previously, removed maxillary right premolar; postextractive pain for several days; after pain subsided, pus drained through socket. Patient was ignorant of any systemic disturbance excepting slight rheumatic pain some time ago, accompanied by malaise, but she and her husband observed that while she was getting smaller, her head was getting bigger and "bumpy"—had difficulty in getting hats to fit. Roentgenograph report: marked density in bone shadow of skull, excepting mandible; mottled appearance because of irregular distribution of new bone; maxillary sinus seemed obliterated.

## X. Sixth Session (Annual Dinner): Evening, March 17; Abstracts 53–61

### A. Greetings from representatives of dental organizations: abstracts 53–57

53. American dental association. *Frank M. Casto, Ph.G., M.D., D.D.S., President; School of Dentistry, Western Reserve University, Cleveland, Ohio.* May I convey to you cordial greetings from the officers, trustees and members of the American Dental Association. The opportunity to meet with this particular group is not only a privilege, but a real pleasure. Furthermore, it is a distinct privilege to represent the American Dental Association upon this occasion. It is needless to say that the work in your field of endeavor is essential to the scientific advancement of a profession, for research and investigation form a substantial part of the foundation upon which the superstructure of any lasting profession is built. One cannot but commend, in the highest terms, the young men who are courageous enough to enter this field, for it requires long, tedious, and thorough preliminary training, and unselfish and altruistic devotion to the work. Emoluments and self aggrandizement are of little concern to the truly inspired and conscientious investigator. Moreover, worth-while research requires patience, fortitude, industry, accuracy, a high degree of mature judgment, a broad concept of the problem, and, perhaps most of all, intellectual integrity.

If one should be presumptuous enough to offer a criticism, it would be against premature publication of findings by over-enthusiastic or

over-zealous workers, and acceptance of results as representing facts under conditions where facilities are inadequate, or where supervision or direction of the work is of doubtful character. Sometimes, for obvious reasons, there may be a strong urgency to do these things, which may defeat the object for which the investigation was intended. May I hazard the opinion that efficient organization is just as essential in the development and execution of a research program as it is, let me say, in carrying out the administrative policy of any other project. The further study of the complex biologic problems of development and growth of the human organism in its many ramifications and multifarious functional activities, of histological and pathological changes and physiological processes and reactions, of the relation between dental disease and systemic involvements, and of the prevention, control, and treatment of dental lesions, are but some of the phases which will require even greater and more concentrated effort than ever, on the part of your group and others engaged in similar work. Dentists must rely upon you for factual information to guide them in making deductions and forming conclusions in the care and treatment of their patients. Only when this knowledge is possessed, and is supplemented with experience and coordinated with clinical observation, can dentists hope to render the best service; and this should be the primary purpose of every practitioner.

I am pleased to point to the fact that the American Dental Association has expended more than $400,000 in sponsoring and supporting research. Several grants were approved this year, the largest of which was for the work in progress at the National Bureau of Standards in the investigation of dental materials. In addition, several thousand dollars were appropriated for use by the Council on Dental Therapeutics, the work of which can very properly be placed in the category of scientific investigation. It seems to me unfortunate that more money is not available to carry out a broader and more comprehensive program under the sponsorship of our national organization, but it would seem unwise to undertake a project without the assurance of sufficient funds to carry it to a successful conclusion. To make my position clear, may I state that I am wholeheartedly in favor of research and will support it when developed and conducted upon sound principles, but I am not intrigued by fly-by-night excursions in this

ultra-important scientific field, for I realize, in part at least, the responsibilities and obligations involved in the organization, administration, and direction of a legitimate research program.

54. DENTAL EDUCATIONAL COUNCIL OF AMERICA. *Henry L. Banzhaf, B.S., D.D.S., LL.D., F.A.C.D., President; Dental School, Marquette University, Milwaukee, Wis.* I esteem it a great privilege to address this group of research workers, scientists, educators, and members of the profession who are especially interested in investigation and research. In presenting the greetings of the Dental Educational Council of America, I am particularly gratified to remind you that the Council has been engaged in an earnest research in dental education for the past twenty-five years, and that the result of this work is reflected in the courses now being offered in the various dental schools. In fact, the modern evolution of our entire system of dental education rests upon the researches that have been made by the Council, by the Carnegie Foundation for the Advancement of Teaching, and by the Curriculum Survey Committee of the American Association of Dental Schools, which study is still in progress. Permit me to call your attention to an article which appeared in the February number of *Harper's Magazine*, under the title: "An excuse for universities." The writer of this article takes the position that, as the result of the great economic depression through which we are passing, there will be no more John Harvards, Elihu Yales, and Johns Hopkinses. I do not share these radical views, and am of the opinion that when prosperity returns, as it surely will, many noble men and women of wealth will again endow universities, hospitals and institutes for research, and will find this a more satisfactory way of sharing the wealth than through confiscation by government.

55. AMERICAN ASSOCIATION OF DENTAL SCHOOLS. *John T. O'Rourke, D.D.S., F.A.C.D., President; Dental School, University of Louisville, Louisville, Ky.* I am pleased to have this opportunity to extend greetings from the American Association of Dental Schools, and to congratulate the International Association for Dental Research on its remarkable growth and its present splendid meeting. Much has been said here tonight on the value of research. One can but agree that in terms of human welfare research is of extreme worth. It is doubtless true that most of our present-day problems can be solved by two

factors: research and education. That many problems are not solved is due to the hit-or-miss subjective approach to their solution, and to minds which are not prepared to interpret the findings of unprejudiced investigation. This is true not only in the field of dentistry, but also in fields political, social, and economic. I look forward to the time when, as the members of this Association create new knowledge, dental education may be more effective in causing its speedy application to problems of oral health-service.

56. CHICAGO DENTAL SOCIETY. *Stanley D. Tylman, D.D.S., M.S., F.A.C.D., President; Dental School, University of Illinois, Chicago, Ill.* The speaker, voicing the Chicago Dental Society's interest in the advancement of dental research, extended to the members a hearty welcome to the most important dental center in America. His welcome was expressed so earnestly that it included a cordial invitation to the Association to hold its next general meeting in Chicago during the progress of the Chicago Dental Society's annual mid-winter meeting in February 1936, for which the usual extensive preparations are already under way.

57. CHICAGO SECTION OF INTERNATIONAL ASSOCIATION FOR DENTAL RESEARCH. *Emil Mueller, D.D.S., Chairman; Dental School, Northwestern University, Chicago, Ill.* The speaker expressed the Section's pleasure to welcome the Association to Chicago. He said that throughout the series of annual meetings the programs have been progressively improved. Extending a standing invitation to the Association to meet annually in Chicago, he expressed the opinion that, by accepting it, the Association would be assured of effective coöperation in making the meetings cumulatively useful.

### B. ADDRESSES; ABSTRACTS 58–61

58. DENTAL EDUCATION AND RESEARCH IN GREAT BRITAIN. *Ernest Matthews, Ph.D., M.Sc., L.D.S., Manchester University Dental School, Manchester, England.* The peculiarities of the British position resulting from the 1921 Act were indicated, whereby at present out of a total register of 14,000 dentists permitted to practise, only 7,000 have graduated from dental schools. The others are allowed to practise by virtue of the fact that they were doing so prior to the passage of the Act. Any person now desiring to commence the practice of dentistry

must, however, obtain either a dental degree or diploma. The policing of the profession, both from the point of view of its own interests and those of the public, is carried out by a body known as the Dental Board of the United Kingdom, whose thirteen members are drawn from the graduate and non-graduate members of the profession, from the General Medical Council, and from the Government. At present it is composed of 6 dental and 7 non-dental members. The relatively large number of students now entering the schools who propose to take both dental and medical qualifications is an indication of the closer liason of medicine with dentistry in Great Britain. There are aspects of the American curriculum which are practically absent from that in the British schools, notably organized courses in crown-and-bridge work, dental economics, and English composition. Moreover, the almost complete absence of any organized post-graduate or graduate work in British schools is in distinct contrast to the American position. The dual aspect of the Dental Board's research policy, whereby the Dental Investigation Committee of the Department of Scientific and Industrial Research conducts the materials research, and the Dental Diseases Committee of the Medical Research Council conducts the supervision of the biological research, was explained. Comparisons were made with the work of the U. S. Bureau of Standards, and their policy of specification development was felt to be ideal under the existing conditions. Finally the existence of numerous enthusiastic research groups, as typified by the various local sections of the International Association for Dental Research, was considered adequate testimony to the virility of American dentistry.

59. ADDRESS OF RETIRING PRESIDENT. *J. L. T. Appleton, Jr., B.S., D.D.S., Dental School, University of Pennsylvania, Philadelphia, Pa.* (Pages 140–47.)

60. INTRODUCTION OF PRESIDENT-ELECT. *P. C. Kitchin, M.S., D.D.S.*, Vice-president-elect; *Dental School, Ohio State University, Columbus, Ohio.* (Pages 147–150.)

61. INAUGURAL ADDRESS: *Theodore B. Beust, D.D.S., M.D., F.A.C.D.*, President-elect; *Dental School, University of Louisville, Louisville, Ky.* (Pages 150–54.)

[Executive proceedings followed: page 225.]

## XI. Papers Read by Title: Abstracts 62–121

### A. Contributions by Vienna Section: Abstracts 62–79

62. Effects of orthodontic movement on germs of deciduous teeth. *Karl Breitner, M.D., and M. Tischler, M.D., Vienna, Austria.* Whether, and how, germs of deciduous teeth are influenced by orthodontic movement is a very important matter in early treatment. Unless the orthodontist understands the related processes, he is unable properly and with clear conscience to regulate deciduous teeth. Movements of deciduous teeth were made experimentally on young monkeys, and the affected parts of the jaws examined histologically, with the following results: (*a*) Germs that lie between roots of deciduous teeth move with the roots surrounding them. (*b*) Germs that lie so close to roots of deciduous teeth that movement of roots toward germs takes place (germs being somewhat compressed) shift in the direction of the movement of the roots. (*c*) Germs that are so near roots of deciduous teeth that they lie (in the direction of movement) behind roots of deciduous teeth which have been moved (roots of these teeth having been drawn away from germs) do not remain stationary, but also shift in the direction of roots of deciduous teeth which have been moved. Thus it is evident that, in intensive tooth-tilting, the tooth near the root-tip of the deciduous tooth carries out the opposite and undesirable movement, and tooth-tilting appliances are unsuitable for deciduous teeth. On the other hand, the rule that deciduous teeth can also be regulated is supported theoretically and practically.

63. Tusks of Indian elephants. *Fritz Driak, M.D., Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria.* With the help of x-ray photographs, ground sections, and sections, the structure and development of tusks of Indian and African elephants of different ages were studied microscopically with direct, reflected, and polarised light. Tusks occur only in the maxilla, especially in the os intermaxillare. Their size and form are different for the two kinds of elephant. The Indian elephant develops, in os intermaxillare, a deciduous incisor that is ejected during the first year. In the preparation examined—2-month embryo—such an incisor was studied. It was impossible, in extensive serial sections of the surroundings, to find a germ for a permanent tusk. Therefore it is pos-

sible that this deciduous germ is the original tusk-germ. However the following findings are opposed to this view: A permanent tusk of an Indian elephant two years old—in which relative positions of enamel, cementum, and dentin were studied—is completely covered with cementum. Between cementum and dentin, in the region of the tooth-cone, a circular layer extends about 4 cm. toward the root; in all other regions, dentin lies immediately beneath the cementum. This layer of enamel is more extensive than that on the deciduous incisor of the embryo. Because the enamel layer was not broader and longer at the more advanced age, these findings indicate that the germ of the deciduous incisor cannot be that of the permanent tusk. For old elephants it was found that as the tusk goes into function, its coat of cementum is lost from the part that passes out of the alveolus. Later the enamel is lost through abrasion. The tubules of the dentin have a spiral structure, which increases the capacity of the tusk to meet resistance.

64. ANCHORAGE OF PARTIAL REMOVABLE DENTURES. *Richard Grohs, M.D., Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria.* Direct retainers, used for fixation of saddles against vertical or horizontal displacement, engage the teeth by spring tension, without any type of torsional stress being transmitted to the abutments when the replacement is not in function. Material for the retainers must have a large percentage of elasticity. Direct stress of mastication is transmitted to the abutments by the occlusal-rest portion of the direct retainer. The occlusal rest must be rigid, as it is a short arm. This rigid type of retention precludes possibility of horizontal movement of saddle under biting stress, hence much of load is carried by abutments, unless some form of stress-breaker is inserted between saddle and direct retainer.

65. OPERATIVE TREATMENT OF MALIGNANT TUMORS OF THE CHEEK. *Otto Hofer, M.D., Jaw Department (Director Prof. Dr. H. Pichler), First Surgical Clinic (Director Prof. Dr. A. Eiselsberg), University of Vienna, Vienna, Austria.* Literature of malignant tumors of the cheek imputes to them special malignancy, and indicates that their excision, or their destruction by radium, may entail considerable lock-jaw, intake of food becoming more difficult, oral hygiene deteriorating, and prompt diagnosis of recurrence being prevented. In 40

advanced cases (34 men, 6 women; 5.71 percent of 700 jaw tumors treated at the Clinic for Maxillary Surgery), alveolar apophyses of both jaws, Highmore's antrum, even soft palate and tonsils were involved; often the primary site could be ascertained only by anamnesis. *Summary of findings.—Primary site:* (*a*) 3 (1 melano-sarcoma, 1 cylindroma, 1 basal-cell carcinoma), within cheek tissue; covered by healthy skin and mucous membrane: (*b*) 2, in skin; (*c*) 5, place of origin unknown; (*d*) 10, no glands; (*e*) 7, glands in stage of Berven I (palpable, but soft); (*f*) 20, glands in stage II (firm and large); (*g*) 3, glands in stage III (grown into surrounding tissue). *Cases free from relapse:* (*h*) 3, when first seen, did not show glandular swelling; (*i*) 7, glands in stage I or II. *Operated patients:* (*j*) 3, none in whom glands were in stage III could be kept free from relapse for a long time. *Histologically*, all cases excepting first three (a): diagnosis was squamous-cell epithelioma. In addition to *radical excision*, the glands were removed at the same sitting. Tumor tissue could be demonstrated in extirpated lymphatic glands in only 4 cases. Mandibular bone was operated upon, in 3 cases, by resection of mandible; in 4, by so-called "Spangenresektion," involving alveolar process and ascending ramus of lower jaw, with coronoid process. In 4, upper jaw had to be removed in part—in 2, upper and lower jaws; in 1, besides total resection of upper jaw, évidement of orbit was necessary. *Deaths:* 1, from erysipelas and pneumonia; 1, from septicemia and pneumonia. Of the total number, 18 (48.6 percent) were free from *relapse* after an average observation-time of 41.6 months; 16 (43.2 percent), after one year, showed local and glandular relapses, of which 12 were reoperated. Thirteen years later, in 1 case of cylindroma of cheek and upper jaw, there was local recurrence extending toward base of skull and spreading over cranial fossa. A basal-cell carcinoma, recurring after 3 years, was reoperated in 1932—no relapse. In only 4 cases was it possible to *cover the defect* by mobilizing only edges of the wound without any grafting of mucous membrane or skin. Grafting was usually done simultaneously with the operation. In 10, defects of mucous membrane were covered by skin-grafting (Thiersch's method); in 8, mucous membrane was substituted by skin flap from the neck and put in place by Israel's method; in 7, total defects of cheek were covered with double skin-flaps from forehead and head—

bare frontal-skin having been used as a substitute for mucous membrane, hairy head-skin for the outer covering. Cheek carcinoma, compared statistically with supramaxillary tumors (recorded by Pichler), showed four times as many relapses, these also occurring in a shorter time. Squamous-cell epithelioma is particularly malignant—results can be improved only through radical operation. For cheek tumors that are quite circumscribed, without any glandular involvement, local excisions may suffice. In all other cases, affected glands and interjacent tissue should be removed with the primary tumor, in one piece if possible.

66. CASES IN ORAL SURGERY. *Emerich Kotanyi, M.D., General Hospital, University of Vienna, Vienna, Austria.* (No manuscript for publication.)

TABLE 2

*Analytic data on normal constituents of saliva*

| SUBJECT | K | Ca | P | Na | Cl |
|---|---|---|---|---|---|
| | *mgm. %* | *mgm. %* | *mgm. %* | *mgm. %* | *mgm. %* |
| I | 69.0 ± 4.8 | 6.0 ± 0.2 | 17.2 ± 3.2 | 115.0 ± 21.5 | 93.7 ± 11.7 |
| II | 81.2 ± 2.19 | 4.6 ± 0.1 | 13.3 ± 2.2 | 33.6 ± 7.26 | 50.1 ± 1.8 |
| III | 60.3 ± 2.26 | 5.2 ± 0.2 | 15.0 ± 2.3 | 31.3 ± 9.34 | 37.1 ± 1.6 |
| IV | 60.8 ± 3.5 | 4.5 ± 0.3 | 14.7 ± 2.8 | 36.0 ± 16.7 | 42.6 ± 1.0 |
| V | 82.4 ± 5.0 | 5.0 ± 0.3 | 16.6 ± 2.8 | 36.4 ± 12.9 | 50.0 ± 3.2 |
| VI | 75.1 ± 3.26 | 5.6 ± 0.3 | 15.3 ± 2.7 | 29.6 ± 6.8 | 41.2 ± 2.2 |

67. NORMAL CONSTITUENTS OF HUMAN SALIVA. *Hermann Mathis, M.D., Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria.* In numerous analyses of mixed saliva from six healthy persons whose mouths were free from caries and inflammation of the mucosa during the period of investigation, an attempt was made to obtain standard values. After many modifications of current micro-analytical methods in biochemical research, to insure duplication of the analytical results, the mean values in *table 2* were obtained.

68. BIOLOGIC PROBLEMS IN ORTHODONTIA. *Balint Orban, M.D., Histological Laboratory (Director Prof. Dr. B. Gottlieb), Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria.* During study of histologic specimens of human jaws containing teeth exposed to irregular occlusion, various changes in periodontal mem-

brane and surrounding bone were noted. Traumatic changes in periodontal membrane are like those due to orthodontic treatment. *Slight* trauma causes resorption of alveolar bone on the side of pressure, and new formation of bone on the side of extension. When the pressure (trauma) is *stronger*, periodontal membrane may become compressed—and necrotic, when no resorption of bone can occur. In such cases resorption of bone takes place from surrounding marrow spaces, or from that part of periodontal membrane which was not compressed sufficiently to induce necrosis. In orthodontic treatment very slight pressure should be used (according to findings of A. M. Schwarz, not more than 20 grams per sq. cm. of surface) to avoid compression and anemia of periodontal membrane. The observed changes in human jaws are like those noted in experimental work on dogs and monkeys.

69. DENTAL DISEASE AND DENTAL CARE IN CHILDHOOD.[8] *Hans Pichler, M.D., Dental Institute, University of Vienna, Vienna, Austria.* This paper, a comprehensive survey of all oral and dental diseases occurring in childhood, their symptoms and pathology, includes discussion of the work of Stein, who statistically studied relationships between periapical and tonsillar infections and rheumatic diseases in infancy. Stein found higher incidence of rheumatic diseases in children suffering from dental infection and from angina than in children having healthy teeth and tonsils. Disturbances of parathyroid function are of primary importance in development of enamel defects, but other systemic conditions, such as gastro-intestinal diseases, measles, etc., also play an important rôle. The work of A. M. Schwarz on prevention and early treatment of malocclusions receives special mention. The author concludes that, for the prevention of pathologic conditions, more can be done in childhood than during all the rest of life.

70. WHAT BECOMES OF ROOT-RESTS IN JAWS? *Otto Preissecker, M.D., Histological Laboratory (Prof. Dr. B. Gottlieb), Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria.* When a root is fractured during extraction, the root-ends must be removed, excepting in cases where the fractured root is from a normal, uninfected

[8] Abstracted by Rudolf Kronfeld, M.D., D.D.S. (Chicago Section), from the author's paper entitled: Zahnerkrankungen und Zahnpflege im Kindersalter: *Wien. klin. Wochensch.*, 1933, No. 26 (reprint).

tooth, and where removal would probably cause complications. There is no difference between deciduous and permanent teeth in these respects. Healing at infected root-ends is impossible without pathologic disturbances. Apices of a deciduous tooth in the jaw of an adult, after the resorption process, need not be removed. Apices of permanent teeth, seen occasionally in x-ray pictures, need not be removed if they do not cause any trouble to the patient and there is no indication of oral sepsis.

71. ACTINOMYCOSIS, WITH FATAL ISSUE. *Franz Schönbauer, M.D., Dental School, University of Vienna, Vienna, Austria.* (No manuscript for publication.)

72. CEPHALOMETRIC DIAGNOSIS IN ORTHODONTIA. *A. Martin Schwarz, M.D., Histological Laboratory (Director Prof. Dr. B. Gottlieb), Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria.* Tele-x-ray profile-photographs provide much new knowledge, including facts about the relationship of the plane of denture to the skull. Although Simon's gnathostatic method, as the practical precursor of the tele-x-ray method, afforded very valuable information, it permitted error because with it one could determine the denture plane only from the variable position of the teeth; it was impossible to distinguish clearly how far a mere group of teeth projected beyond the denture-plane, or how far this plane was oblique to the horizontal skull-plane, i.e., ear-eye-plane. The straight line between the spina nasalis anterior and posterior affords a measurement plane of the relationship in question ("plane of spina"). This line, elongated backward, forms an average angle of 7 or 8° with the ear-eye-plane ("biomet-" angle); but varies individually between 0 and 15°. If this angle is much larger than 7 or 8°, the chin in the profile *recedes*, as in a case of Angle Class II, even when the occlusion is normal (*backward inclination*). If, however, the angle is much smaller than 7 or 8°, the chin in the profile *proceeds*, as in a case of Angle Class III, even when the occlusion is normal (*forward inclination*). Hence the angle of denture-plane as well as mesiodistal malocclusions may determine shape of the profile. These factors together may increase or diminish effects on a profile according to the resultant of their influences. Additional factors affecting the profile are anatomical micro- and macrognathia inferior (i.e., under- or overdeveloped prominentia mentalis);

development of soft-tissue parts of the jaw region; shape of forehead—a steep forehead accentuates the jaw region, a flat one makes it recede; denture-plane may incline toward either side (*inclination downward right, or downward left*), but this anomaly is rare and therefore not of much practical importance. The "*plane of spina*" also provides a *natural base* for the maxillary tooth-row; and enables one to measure distance of edges of incisors, and of cusps of molars, from this plane. With these measurements the base of the model can be made *anatomically precise.* Thus we come into possession of correct measurement for the elevation or depression (supra- or infra-occlusion) of any group of teeth, with their alveolar processes, independently of the inclination of the denture-plane to the skull-plane.

73. QUANTITY IN ONTOGENESIS AND PHYLOGENESIS OF TEETH. *Harry Sicher, M.D., First Anatomical Institute (Director Prof. Dr. F. Tandler), University of Vienna, Vienna, Austria.* It has long been known that in ontogenesis of teeth, growth of epithelium plays the most important part; that complex tooth-forms of mammals arise through differential growth of epithelial cells according to place, direction, and intensity. Of course, in phylogenesis, quantitative growth of epithelium—and consequently of enamel—is a principal factor in development and differentiation. All orthogenetic developments are marked by increasing complexity in cusps or folds of teeth. Besides, there is often simple enlargement of certain teeth; e.g., tusks of elephants, lower canines of tigers, upper canines of Machairodontinae, etc.; sometimes, also, progressive simplification, diminution, and degeneration. But the dominant *qualitative* change in development of teeth is not a single occurrence in orthogenetic lines—it occurs in almost all organs of such a series of forms. The most striking and the best known example is that in development of the horse. From such facts, genetic explanation of orthogenesis can be deduced by extension of Goldschmidt's hypothesis of quantity of genes. If it be assumed that, in phylogenesis, genes tend to increase in quantity—and that increase is comparatively greater for genes which preponderate from the beginning—this law of differentiated phylogenetic growth of genes may explain the above-mentioned processes. In orthogenesis, adaptation once begun continues to be built up in a straight line of development; it may reach a degree of noxious exaggeration (canines of sabre-

tooth tiger, tusks of mammoth, antlers of giant stag, etc.). Some hitherto unexplained facts become understandable on this law. Thus the anlage and differentiation of an organ in embryogenesis occur earlier, the greater the importance of the organ in phylogenesis. Increase in quantity of genes—believed to be a catalytic factor—causes acceleration of developmental processes. With this progression, rate of development becomes swifter—a process which has played a dominant part expecially in the evolution of the human brain.

74. BACTERIOLOGY OF PULPLESS TEETH. *Georg Stein, M.D., Dental Institute (Director Prof. Dr. H. Pichler), First Surgical Clinic (Director Prof. Dr. E. Ranzi), University of Vienna, Vienna, Austria.* Weber and Pesch, Feldman and Ruttner, Blumenthal and Zull, and others, have recently reaffirmed, as an established fact, that *all* pulpless teeth are infected. If this were true, all pulpless teeth should be extracted. In a study of this problem, bacteriological examinations of pulpless teeth were made by careful methods. Routine contamination by mouth flora was avoided and cultures made in media suitable for aerobic and anaerobic organisms. The teeth—300—were obtained by extraction (277) or apicotomy (23). *Extraction technic:* (*a*) after removal of tartar, mouth washed with hydrogen peroxide or Pregl's iodine solution; (*b*) tooth to be extracted, neighboring teeth, and gum and pockets painted with 3–5 percent iodine tincture; (*c*) iodine partially removed with alcohol; (*d*) all pockets around tooth electrocauterized. *Cultures:* Rosenow's medium (glucose-brain broth, glucose-brain agar), Schottmüller's blood-agar, and other special media. *Controls:* 62 vital, sound, non-infected teeth of all kinds; about 29 percent showed *contaminations*, less frequently on anterior teeth than on bicuspids and molars (12 percent on anteriors; 47 percent on bicuspids and molars). Contaminations arose chiefly from very deep gum pockets or bifurcations not covered by gum. Despite these special difficulties, *27 percent of 300 pulpless teeth were sterile.* There was no great difference between those that had not been treated, and those that had incomplete root-canal fillings; nor between those that were roentgenographically positive or negative in this respect (26 percent of *sterile* teeth were positive; 29, negative). *Of the total number that had complete root-canal fillings, more than 50 percent were sterile.* Of 319 cultures, streptococci occurred in 230—104 strains yielded green color-

ation; 22 were hemolytic; 83 showed no differential alteration; 21 were not examined. The results for sterility, stated with reserve, show that with the methods employed no growth of bacteria occurred; but presence of unknown bacteria, non-cultivable by the methods used, or of filterable virus, was not impossible. The findings indicate, however, that a large proportion of pulpless teeth are free from microörganisms; and that, by suitable root-canal treatment, important betterment of such teeth can be assured. Efforts to improve root-canal treatment should therefore be continued. Routine extraction of all pulpless teeth is an indefensible procedure. It should be possible to find a way to distinguish, in the mouth, between teeth that are probably infected and such as probably are not. Determination of sensibility by percussion, or by pressure against the jaw in the region of the apex, and examination of the regional lymph glands, offer suggestive possibilities.

75. HYPOPLASIAS OF ENAMEL OF DECIDUOUS TEETH. *Georg Stein, M.D., Histological Laboratory (Director Prof. Dr. B. Gottlieb), Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria.* At birth much of the enamel of deciduous teeth has already been formed; about six months thereafter, its formation is almost complete, but calcification of enamel of permanent teeth has only been begun. As rickets usually does not appear before 4 to 6 months after birth, hypoplasias of enamel (often due to this cause) occur less frequently on deciduous teeth than on permanent ones. Hypoplasias rarely occur on *edges of deciduous incisors*, which usually are calcified at birth. In examinations of deciduous teeth, occasional occurrence of such hypoplasias suggested disturbances of intrauterine metabolism. This possibility was studied in deciduous incisors of two groups of children: (*1*) born prematurely; (*2*) born at term, and severely ill during the earlier weeks of life from intestinal maladies, pneumonia, rickets, etc. Of 12 in *Group 2*, 7 (nearly 60 percent) exhibited typical hypoplasias on *edges of deciduous incisors*—and also on other teeth at places showing corresponding development (*fig. 2*). Not one of the 15 children in *Group 1* showed hypoplasias of this type, although at some distance from edges of deciduous incisors, and on other teeth, there were developmental faults in some cases. Such faults are unlike defects of deciduous incisors in cases where upper incisors and often also canines are rapidly destroyed while the other teeth remain

unaffected (*fig. 3*); in most of these cases, the children, when put to sleep, used bottles bearing nipples dipped into honey or "castor sugar" conditions that facilitated local fermentative destruction. These observations suggest that hypoplasias on *edges of deciduous incisors* represent disturbances of metabolism—especially of calcium before

Fig. 2. Typical hypoplasias on edges of deciduous teeth, and on other surfaces showing corresponding development.

Fig. 3

Fig. 4

Fig. 3. Defects in deciduous incisors; other teeth normal. Caused by conditions that facilitated local fermentative destruction (e.g., use of bottle bearing nipple dipped into honey).

Fig. 4. Battery-apparatus (Sternax A) for electro-sterilization. To switch on current, turn button so that arrow points to triangular mark.

normal term of birth. In premature children such disturbance seems to be caused by early interruption of intrauterine development. In children born at term, such hypoplasias occurred presumably during intrauterine life. These hypoplasias, by their localization, enable one to estimate accurately the period at which disturbance of development

was active, and therefore seem to be significant for study of intrauterine disturbances of metabolism.

76. TREPANATION OF JAW BONES IN ACUTE PERIOSTITIS; SIMPLE INSTRUMENT FOR LOCALIZATION OF THE APEX. *Richard Trauner, M.D., Vienna, Austria.* An abscess at the apex of a tooth is formed in, and surrounded by, bone. Before pus forces its way into soft tissue and fluctuation can be felt, the patient has had much pain. The abscess should be opened in the bone—by early extraction, by opening the canal into the apex, or by direct trepanation. The last method—necessary when tooth should be conserved, or opening of canal is impracticable or does not eliminate pain—may be quickly performed and is used too infrequently. When the apex is located, so that the abscess may be entered directly with a bur, the operation is very easy; on anterior teeth it may be done subcutaneously without preparation of soft tissues. For localization of the apex, a simple instrument—a U-shaped loop—may be made from stainless-steel wire, or Miller-needle. One branch is made so thin that it may be pushed into the root canal exactly to the apex; the thicker branch extends over the crown into the vestibulum, its end indicating position and distance of the apex in the bone. With a bur, trepanation of bone through mucous membrane into the abscess is quickly performed just above the outer end of the loop, thus making an artificial fistula, pus flowing from the abscess along the shortest route, not through the long and thin canal. The same method and instrument may be used to locate the apex before a root resection, especially for lower lateral teeth, which are surrounded by thick bone. The roots cannot be felt under the bone and, without a location-mark, one sometimes goes too far distally or mesially in searching for the apex. Often quick trepanation facilitates a filling that otherwise could not be made without inducing pain. An artificial fistula, in such cases, may make root resection unnecessary.

77. HISTOLOGICAL AND CLINICAL INVESTIGATIONS OF *Leontiasis ossea* (Virchow). *Richard Trauner, M.D., General Hospital, University of Vienna, Vienna, Austria.* (No manuscript for publication.)

78. AUTOPROTEOLYSIS OF HUMAN SALIVA. *Josef Weinmann, M.D., Histological Laboratory (Director Prof. Dr. B. Gottlieb), Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria.* The author, in coöperation with Dr. P. Fantl, continued the

study reported a year ago (*J. Den. Res.*, 1934, *14*, 205). Only a slight alteration of pH occurs during autoproteolysis. Protease in *fresh* saliva is derived from migratory cells from oral mucous membranes, not from bacteria. The quantity of salivary protease varies greatly, but keeps within certain limits for any individual.

79. CAN ELECTRO-STERILIZATION OF ROOT-CANALS BE CONDUCTED FREE FROM DANGER? *Hermann Wolf, M.D., Dental Institute (Director Prof. Dr. H. Pichler), University of Vienna, Vienna, Austria.* In 1932, in Austria, new security regulations for use and construction of electro-medical apparatus increased the difficulties in the practice of electro-sterilization. These regulations prohibited all contacts between main current and circuit of treatment and box of apparatus, and also use of all apparatus that brought direct current from the light-circuit. We may use as current-sources, for electro-sterilization and galvanic testing of teeth, practically only light-current and electrical batteries or accumulators. For the dentist who has only *alternating* current we recommend use of a battery but not of an accumulator. The author's apparatus (Sternax A, *fig. 4*), containing a good electric battery, is very effective and economical. It is serviceable for more than one year in an active practice—at a working cost of only about 20 cents per month. The dentist who has *alternating* current can also use this energy with the aid of special rectifying apparatus (Borschke). The author's apparatus, in use for several years, has special advantages owing to elastic regulation and automatic limitation of current by rectifying valve (Sternax B). The security regulations provide that there shall be no leading connections between light current and treatment circuit. Therefore electro-sterilization can be conducted, without danger, with both types of apparatus. Danger can be completely eliminated only with battery-apparatus, because with an alternating-current apparatus there is at least the theoretical possibility of grounding (involuntary earth connection) through some defect. This consideration, and the low cost of the battery-apparatus, lead the author to prefer the latter agency.

### B. CONTRIBUTIONS BY BUDAPEST SECTION: ABSTRACTS 80–82

80. DEVELOPMENT OF ENAMEL. *Deszö Hattyasy, M.D., Stomatological Clinic, Budapest, Hungary.* In the author's belief, based on

his investigations, enamel rods consist of two parts: (*1*) an *outer* one, forming a tube originating from the inner network barrier of enamel cells, and (*2*) an *inner* part, i.e., content of the pyramids, secreted from enamel cells. New enamel-substance arises in enamel cells and goes through a ripening process, occurring first as small drops that stain like the plasm of cells, later staining becoming more distinct until it finally attains the color shown by young enamel. Newly formed enamel passes through 4 to 5 stages of development as shown by different degrees of staining, which imply chemical changes.

81. SKELETAL REMAINS OF EARLY MAN IN CAVE NAMED "SUBALYUK." *Jósef Szabó, M.D., Director, Stomatological Clinic, Budapest, Hungary.* In 1932, in cave "Subalyuk," near Eger, Hungary, there were discovered some skeletal remains of early man, including parts of jaw, which were examined by the author. Unfortunately the jaw is incomplete, consisting only of middle part (symphysis region) connected with small marginal part of right side, and horizontal branch of left side adjusted to middle part; right jaw, left angulus, processus condyloideus, and coronoideus are missing. In the left fragment are teeth $\overline{|5\ 6\ 7\ 8}$; in the middle part, the six anterior-teeth and first right bicuspid. Three molars, undoubtedly belonging to the same jaw, were found separated therefrom. Most remarkable is complete lack of chin-top. Instead of modern man's protuberantia mentalis, there occurs a slightly prominent triangular area 12 mm. high and 20 mm. broad. In profile, the line of symphysis runs downward and backward, but probably there would have been further development of chin top, as in jaw remains of Heidelberg man. On the left side, the foramen mentale, under the mesial root of the first molar, is farther back than in modern Europeans. The foramen mentale shows the hominoid characteristic of being situated in a fossa that lies distally and extends upward. Jaw dimensions indicate the remains are nearer modern European than Heidelbergian. Distance of foramen mandibulare from last molar is 10 mm. greater than in modern man! Teeth are much abraded, surfaces indicating the individual was 30–40 years old. No decay. Interdental alveolar-walls reach nearly to the necks of the teeth. Crown indices, measured after Hrdlicka, accord with his opinion on this subject. Pulp chambers are relatively wide.

82. TUBERCULAR INFECTION OF TEETH. *Elek Földi, M.D., Erzsébet*

*Tuberculosis Hospital (Director Dr. Oszkár Országh), Budapest, Hungary.* In experiments presenting optimal cultural conditions, on teeth in heavily infected ulcerous, or otherwise tubercular mucosal, environments, in tuberculous patients, it was impossible to find tubercle bacillus—in cavities, exposed (gangrenous) pulp-chambers, and root canals. Data in the literature, clinical observations, and the author's findings lead him to conclude that oral tubercular infections (ulcerous or non-ulcerous) are exogenous or hematogenous, but never dental, in origin. (Published in *Gyógyászat*, 1934, no. 17.)

C. CONTRIBUTIONS BY OTHER MEMBERS OF THE ASSOCIATION, AND BY GUESTS, WHO COULD NOT BE PRESENT: ABSTRACTS 83–121

83. DENTAL AND DIETARY STUDIES OF TIBETANS OF HSI-KANG. *R. G. Agnew, B.A., M.Sc.D., L.D.S., D.D.S., F.I.C.D., and Mary C. Agnew, M.A., Medical and Dental Schools, West China Union University, Chengtu, Szechwan, China.* (No manuscript for publication.)

84. DENTAL TISSUES IN POLARIZED LIGHT. *Edmund Applebaum, D.D.S., School of Dental and Oral Surgery, Columbia University, New York City.* Proell and Diener examined longitudinal ground sections of human teeth in polarized light with crossed nicols and inserted gypsum plate. Their findings, confirmed by the present author, were a uniform color division on buccal and lingual halves of single cusped teeth. When the long axis of the tooth is parallel to vibration plane of polarizer or analyzer, the halves become respectively blue and yellow. In bicuspids and molars more subdivisions are found. Examinations of transverse ground sections yielded further optical evidence of radial arrangement of dentin—an axial cross such as is seen in spherulites. These findings at first seem to justify the conclusion of Proell and Diener that there is orderly radial arrangement of (apatite) crystals in both dentin and enamel. X-ray diffraction studies, such as those of Bale, Hodge, and Warren, further substantiate the concept of preferentially oriented crystals in enamel, but these workers have also shown that crystals in dentin are oriented at random. In decalcified sections of dentin the author observed a picture similar to that of ground sections. To reconcile these findings it is suggested that, in dentin, the organic part is largely responsible for the appearances in polarized light. The organic matrix of enamel is also slightly bi-

refringent, and probably influences optical effects in enamel. Other variations are different interference colors along the bands of Schreger, also higher colors at the surface of enamel, which indicate dissimilarities in amount, chemistry, or orientation of ultimate crystal units.

85. CONGENITAL BILATERAL HEMANGIOMA OF CERVICO-FACIAL AREA. *Frederic W. Bancroft, M.D., F.A.C.S., C. Zent Garber, M.D., Malcolm W. Carr, D.D.S., F.A.C.D., Fifth Avenue Hospital, New York City.* Congenital bilateral hemangioma, with telangiectasis of entire cervico-facial area, in white, female child, seven weeks old. For five weeks thereafter, condition extended gradually, continually invading deeper tissues of neck. Sixth week: notable as period of remission of acute symptoms, accompanied by remarkable general improvement, not attributable to any known cause. This one-week period of remission followed, however, by recrudescence—acute exacerbation of all symptoms; death occurred at end of eighth week. Tumor mass had infiltrated tissues over extensive area, and developed to enormous proportions. Histopathological examination confirmed the clinical diagnosis of hemangioma. Colon: also small hemangioma.

86. IS OSTEODYSTROPHIC TYPE OF PARADENTOSIS, AS PRODUCED IN ANIMALS, IDENTICAL WITH ONE FORM OF PARADENTOSIS IN MAN? *Hermann Becks, M.D., D.D.S., and W. C. Fleming, D.D.S., George Williams Hooper Foundation for Medical Research, and College of Dentistry, University of California, San Francisco, Calif.* Results of animal experimentation, recently reported by Becks and Weber, are supplemented by clinical findings in the oral cavity of dogs that received diets low in Ca and vitamin D. Clinical manifestations supported in detail all histological observations. Roentgenograms aided in diagnosis of pathologic bone-lesions as produced by these diets. This type of paradentosis, designated as osteodystrophic, was compared with certain forms in man, which are characterized by (*1*) primary changes in alveolar structure and bony part of paradentium, which are osteoporotic or dystrophic; roentgenographically recognizable by peculiar radiolucent appearance of interdental and alveolar bone. These changes can also be found in most parts of skeleton. (*2*) Lack of inflammation at beginning of disease (later superimposed usually on primary bone lesion). (*3*) Loosening of teeth and tendency to migration. This symptom can be used for diagnostic purposes only if all

teeth are present and bite is most favorable. (*4*) High frequency of increased Ca, normal or low inorganic-P of blood serum, high frequency of thyroid dysfunction, and dietary deficiencies. (*5*) Resorption of surface of roots, and frequent generalized root-end resorption, without previous orthodontic treatment. The osteodystrophic type of paradentosis constitutes an outstanding form of paradentosis in man. It occurs more frequently than the dental profession at present realizes. It is not identical with Gottlieb's "diffuse atrophy." Its early diagnosis is very important.

87. DENTAL CARIES AND PARADENTAL DISTURBANCES. I: IMPORTANCE OF ADEQUATE DIET FOR HEALTH OF TEETH AND PARADENTIUM. *Hermann Becks, M.D., D.D.S., and Nina Simmonds, Sc.D., George Williams Hooper Foundation for Medical Research, and College of Dentistry, University of California, San Francisco, Calif.* Recent attempts to explain etiology of caries on the basis of one or two factors have suggested to some that there is a possible panacea for the prevention or arrest of tooth decay or paradentosis. It has not been possible to prevent or arrest caries in all children who received even completely adequate diets, apparently because of failure to analyze each child individually for other possible (exogenous and endogenous) etiological factors. Results of animal experimentation suggested study of detailed individual nutritional problems in patients suffering from rampant tooth-decay and paradentosis as part of a broad investigation of etiological factors in dental caries and the dystrophic type of paradentosis. Survey of more than 200 dietary histories revealed high percentages of deficiencies in fundamental nutritional elements. This experience led the authors to work out four different types of diet, which would provide adequate intake of all necessary food constituents for proper formation of teeth and bones. If nutrition *is* important for the health of teeth and paradentium, these diets, when conscientiously followed by patients, will be adequate—and will be "caries preventive" where only nutritional factors are at fault.

88. EVALUATION OF CULTURE MEDIA FOR STUDY OF ORAL BACTERIA. *Basil G. Bibby, B.D.S., Senior Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* An effort to find culture media to reproduce most closely the percentages of various types of organisms in inocula from the mouth. Percentages

of bacterial types in inocula and liquid cultures were determined by direct count; in solid media, by differential colony-counts. Media containing only inorganic salts favored chromogenic bacillary organisms to the exclusion of all others. Starch- and saliva-containing media, with low contents of other nutrients, were highly selective for organisms resembling Leuconostoc. Acid media, with high-carbohydrate contents, encouraged Gram-positive cocci and yeasts. Loeffler's serum, Douglas broth, Douglas agar, blood agar, and tellurite-containing media, greatly exaggerated percentages of Gram-positive cocci, whereas inclusion of dyes reduced this disparity. The value of investigations in this neglected field is limited by technical difficulties.

89. VARIATIONS IN BACTERIAL FLORA IN DIFFERENT MOUTHS. *Basil G. Bibby, B.D.S., Senior Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* To determine whether oral flora undergo marked variations in disease, the method for their estimation previously described (abstract 26) was employed in comparisons between washings and materia alba of both healthy and diseased mouths. For this purpose, 16 mouths were studied: 4 were free from caries and gingival lesions; 4 showed rampant caries; 4, gingivitis; 4, advanced pyorrhea. Few definite differences appeared between averages for these groups. Those striking enough to merit comment were (*a*) high percentage of Gram-positive cocci (56.5 percent) in washings from pyorrhetic mouths; (*b*) complete absence of Gram-positive bacilli in materia alba from carious group; (*c*) comparatively high percentage (10.2 percent) of Gram-positive bacilli in materia alba from pyorrhetic mouths; and (*d*) high percentage of filaments (26.9 percent) in materia alba from caries-susceptible mouths.

90. SIGNIFICANCE OF IODIN REACTION IN ORAL BACTERIOLOGY. *Basil G. Bibby, B.D.S., Senior Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* The blue color produced by some organisms, when treated with iodin solutions, has been used as a basis for classification of oral bacteria and to indicate their fermentative activity. Treatment of mouth smears with six iodin solutions showed that solutions containing 1–5 percent of acid gave most definite color reactions. Nine stock strains of

organisms, tested on successive days, showed no relationship between occurrence of iodin reactions and fermentation of glucose, lactose, or maltose. Tests of seven mouth-organisms, in starch-containing media, gave uniformly negative results: 442 tests were made on streptococci, staphylococci, pneumococci, sarcina, Gram-negative cocci, bacilli, bacteria, lactobacilli, and yeasts grown for different periods in liquid media containing starch and saliva and/or ascitic fluid. Fourteen positive reactions occurred independently of constituents of culture media. Pure strains of three iodin-reacting organisms showed greater percentages of reacting elements when grown on carbohydrate-containing media. Percentages of iodin-reacting organisms in 112 smears from 28 mouths were generally insignificant—there was no apparent relationship between percentage of reacting organisms and condition of mouth. The iodin reaction did not indicate fermentative ability of organisms; and, since all bacterial elements in pure culture did not give the same reaction, it had no value in classifying bacterial types.

91. AGE VARIATIONS IN LESIONS AND ACTIVITY OF DENTAL CARIES. *Charles F. Bödecker, D.D.S., F.A.C.D., School of Dental and Oral Surgery, Columbia University, New York City.* Age variations in activity of caries, as observed clinically, seem to be related to at least two factors: (*1*) character of lesion, and (*2*) change in permeability of teeth. A third, not yet definitely established factor, is the influence of systemic conditions. *Character of lesion* of caries leads to division into three groups: acute crown, chronic, and acute root, according to form of lesion, location on tooth, and activity. These types show the acute crown lesion as having a small, narrow entrance to the cavity; the chronic type has a large, shallow opening. This difference in form of cavity allows undisturbed food retention (with abundant fermentation) in the acute crown-type, and results in rapid progress of caries. In the chronic type there is less opportunity for food retention, hence less fermentation and caries progresses more slowly. The acute root-type attacks exposed cementum of denuded cervices of teeth; it penetrates rapidly toward the pulp, while the crown remains immune. *Change in permeability*, as a factor of variation in caries, was first defined by Beust and Pickerill, and seems to be active 10 to 15 years after eruption. Comparatively high permeability of recently erupted

teeth allows external destructive forces (acids) to penetrate rapidly in *acute* crown-caries. Low permeability of mature teeth bars this attacking force; hence slower penetration of the *chronic* type of lesion. (To be published in *J. Den. Res.*)

92. CAPE-KITCHIN MODIFICATION OF CELLOIDIN DECALCIFYING METHOD FOR DENTAL ENAMEL. *Charles F. Bödecker, D.D.S., F.A.C.D., School of Dental and Oral Surgery, Columbia University, New York City.* Demonstration of organic or protein matrix in human dental enamel has been greatly simplified by the method suggested by Cape and Kitchin (*J. Amer. Den. Assoc.*, 1930, *17*, 193). Their contribution throws light on changes in enamel during caries. By their procedure ground sections of entire teeth can be examined and photographed before, during, and after decalcification, and distribution of protein matrix and its relation to the crown as a whole can be studied. Further, the decalcification process can be observed with polarized light, and areas in enamel that still contain crystalline salts can be recognized by their birefringence. (Corroborated by E. Applebaum; *see* abstract 84.) Enamel has been considered by some as an impermeable, mineral structure. In this belief, the activity of caries was explained on the supposition of variations in oral environment (food retention, bacteria, saliva). Presence of protein matrix increases permeability, particularly during youth. Possibly, because of it, teeth can be affected by pulps as well as saliva bathing their surfaces, and certain variations in activity of caries, which are incomprehensible on any other theory, may be thus explained. (To be published in *J. Den. Res.*)

93. GINGIVAL REATTACHMENT TO ENAMEL. *Charles F. Bödecker, D.D.S., F.A.C.D., and William Lefkowitz, D.D.S., School of Dental and Oral Surgery, Columbia University, New York City.* Gottlieb showed that gingival tissue is firmly attached to enamel under normal conditions. This has been substantiated by Orban, Kronfeld, Becks, Box, Applebaum, Bödecker, and others. Attention has also been called to dangers of mutilation of this attachment by operative procedures. Experimental work on dogs, herein described, indicates that such dangers may not be real, and also shows remarkable recuperative powers of periodontal tissues. Six teeth in five dogs were removed, canals filled, replaced and held in position by splints; two of these

teeth were carefully scraped free from all gingival tissue. Despite this rigorous procedure, interdental gingival papillae became reattached to *enamel* by means of Gottlieb cuticle. These findings may apply also to man, the histological structure of involved tissues being similar in both species. The only differences seem to be the form of the teeth, and the possible germicidal property of dog saliva. Therefore, reattachment of gingivæ to enamel probably occurs in man *in the absence of inflammatory conditions*. (To be published in *Den. Cosmos*; report of Research Committee, Dental Society, State of New York, 1935.)

94. pH OF NORMAL RESTING SALIVA. I: VARIATIONS WITH AGE AND SEX. *Robert E. Brawley, B.S., D.D.S, M.S., Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* Colorimetric pH-determinations were made in resting saliva of 3405 normal healthy individuals, both male and female, ranging in age from 3 weeks to 101 years. The mean or average pH of normal resting saliva, for the entire group, was 6.75, which showed that normal resting saliva is slightly acid—median pH, 6.84. The average pH of normal resting saliva of various age-groups did not vary significantly from the general average, except in the age extremes. In the age-groups 3 weeks to 1 year, the average was slightly higher—in age-groups 80–90 years and 90–100 years, slightly lower—than the general average. The average for males was 6.76; females, 6.73. Slight differences existed between males and females in certain age-groups (50–60, 70–80, and 80–90 years), in which the average for females was slightly more acid. The range was from pH 5.6 to 7.6.; 55 percent fell within 6.6 to 7.0; 83 percent, within 6.2 to 7.4; only 5 percent, within the combined ranges of 5.6 to 6.0 and 7.4 to 7.8. The distribution was very similar in all age-groups, the "spread" having been a little greater in the adult groups. The males comprised 54 percent of the entire group; females, 46 percent. Approximately the same percentages of total cases existed in each pH group except that of 5.6–6.2, where of the number of cases males were 40 percent; females, 60 percent. In the range 7.2–7.4, the division was 62 percent males, 38 percent females; in the range 7.4–7.8, 64 percent males, 36 percent females (*J. Den. Res.*, 1935, *15*, 55.)

95. pH OF NORMAL RESTING SALIVA. II: DIURNAL VARIATIONS.

*Robert E. Brawley, B.S., D.D.S., M.S., Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* Colorimetric pH determinations were made in normal resting saliva of 3405 normal healthy individuals, male and female, ranging in age from 3 weeks to 101 years. Determinations were made at various hours from 7 a.m. to 5 p.m. *Average* pH of normal resting saliva varied throughout the day; during the hour before meals, it was slightly higher than normal (pH 6.75). It was 6.80 before breakfast; 6.83 before lunch; slightly lower than normal during the hour following meals—6.73 after breakfast; 6.68 after lunch. There was similar diurnal variation for different age-groups; variation throughout the day was similar in males and females. There was no significant difference between morning and afternoon averages—6.76 and 6.74, respectively (*J. Den. Res.*, 1935, *15*, 79.)

96. INTRAVENOUS ADMINISTRATION OF ARSPHENAMINE IN TREATMENT OF ADVANCED FUSOSPIROCHETAL DISEASE OF MOUTH AND CONTIGUOUS TISSUES. *Malcolm W. Carr, D.D.S., F.A.C.D., Metropolitan Hospital, New York City.* The advantage of supplemental use of arsphenamine and neoarsphenamine in oral surgery has been demonstrated in several conditions arising from fusospirochetal infection, classified as follows: (*a*) advanced fusospirochetal stomatitis, with deep ulceration and sloughing in adjacent mucous membrane surfaces —buccal mucosa, soft palate, floor of mouth, tongue and lips; (*b*) advanced fusospirochetal infection of mouth, concomitant with acute secondary suppurative process (cellulitis) in which fusospirochetal organisms have been demonstrated at operation in deep submaxillary contiguous tissues; (*c*) fusospirochetal infection of mouth (stomatitis) and pharynx, with secondary extension to remote tissues—middle ear and mastoid process. It is not recommended, however, that intravenous administration of arsphenamine be used as routine treatment for Vincent's stomatitis, nor should the drug be employed without knowledge of the patient's general condition.

97. DENTAL, DIETARY AND ANTHROPOLOGICAL STUDIES OF MIAO TRIBES OF YUNNAN-KWEICHOW BORDER. *Chi Li Ngan, D.D.S., W. R. Morse, M.D., F.A.C.S., LL.D., R. G. Agnew, B.A., M.Sc.D., L.D.S., D.D.S., F.I.C.D., and Mary C. Agnew, M.A., Medical and Dental Schools, West China Union University, Chengtu, Szechwan, China.* (No manuscript for publication.)

98. INHIBITORY EFFECT OF SALIVA ON L. ACIDOPHILUS. *O. W. Clough, B.Sc., D.D.S., Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* Inhibitory action of saliva was tested on *L. acidophilus* grown on Kulp's tomato-juice agar. Lactobacilli were inoculated into agar by adding 2.5 cc. of 5 percent glucose-broth culture, 40 hours old, to 100 cc. of melted agar at 45°C. Immediately after distribution throughout the medium, plates were poured. When the medium had set, sterile glass-tubes were used to cut out "wells" about 11 mm. in diameter, in which saliva and control fluids were placed; the plates were incubated at 37°C. for 48 hours. From 77 apparently healthy adults, 133 specimens of saliva were obtained. Of these, 131 inhibited growth of *L. acidophilus;* 2 did not. One specimen was obtained from each of 77 children aged 6 to 16, of 25 diabetics under hospital treatment, and of 25 women between fourth and ninth months of pregnancy. All tests except 8 in the children's group showed inhibition of *L. acidophilus*. From a study of the children, no correlation could be obtained between extent of dental caries and inhibition of *L. acidophilus* as shown by their saliva. The *inhibitory agent* was found in supernatant fluid, not in sediment, when saliva was centrifuged. When supernatant fluid was filtered through a Berkefeld candle, the first 10 to 12 cc. to collect were devoid of inhibitory properties, but subsequent portions contained the agent. Heat at 75°C. for five minutes destroyed the inhibitory agent, which did not induce lysis of *L. acidophilus*, but was bactericidal in effect.

99. AMINO ACIDS IN DENTAL NUTRITION. *R. G. Daggs, Ph.D., and C. D. M. Day, B.D.S., D.M.D., M.S., Rockefeller Fellow in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* There was no definite gross or histological effect on teeth of rats on diets deficient in cystine and lysine, when examined after clinical symptoms of these dietary deficiencies had become apparent.

100. VITAMIN-C DEFICIENCY AND DENTAL NUTRITION IN RATS. *C. D. M. Day, B.D.S., D.M.D., M.S., Rockefeller Fellow in Dentistry, and R. G. Daggs, Ph.D., School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* Odontoblasts in guinea pigs are very susceptible to slight vitamin-C deficiency. To see whether histological changes could be produced in teeth of an animal that manu-

factures its own vitamin C, young rats were maintained for over eight months on vitamin-C-free diet used regularly for guinea pigs. The work was also designed to show effects, if any, on local conditions in the mouth. There was neither periodontal damage nor caries.

101. APLASIA OF TEETH IN LIGHT OF NORMAL AND PATHOLOGICAL ANATOMY. *Th. E. de Jonge-Cohen, Dr. med. dent. (Zurich), University of Amsterdam, Amsterdam, Holland.* Aplasia of the medial-edge tubercle—practically normal for lateral incisors—occurs also as a variation in form of medial incisors. This aplasia is, however, characteristic of the Hutchinson tooth only when it is accompanied, in addition, by convergence (toward incisal) of both approximal crown-surfaces. Both stigmata may frequently be accompanied by pronounced hypoplasia of enamel, but this is not pathognomonically characteristic of the shape of Hutchinson teeth.

102. TESTS OF ROOT-CANAL FILLING MATERIALS FOR TISSUE TOLERANCE. *C. M. Dixon, D.D.S., and U. G. Rickert, A.M., D.D.S., F.A.C.D., Dental School, University of Michigan, Ann Arbor, Mich.* A search, in its preliminary phase, for new materials, if any, that may be successfully used for filling root canals, including study of adequacy of technique.

103. EFFICACY OF TOPICAL ANESTHETICS. *Edward C. Dobbs, D.D.S., Dental School, University of Maryland, Baltimore, Md.* Efficacy of several accepted topical anesthetic drugs, on oral mucous membrane in students and clinical patients, was determined, in uniform experiments, as follows: A small cotton pellet, saturated with solution of anesthetic, was placed into muco-buccal fold, right side of median line, and left there for five minutes. Degree of anesthesia, ascertained by piercing treated mucosa with sharp instrument, was recorded as none, slight, mild, or profound. Solutions were made, on day of use, of benzyl alcohol; Nupercaine, marketed by Ciba Co.; Metycaine, marketed by Lilly Co.; Tutocaine, marketed by Winthrop Chemical Co.; Butyn, marketed by Abbott Laboratories; Procaine borate, marketed by Searle and Co.; and Novocaine hydrochloride, marketed by Metz and Co. Three gave profound anesthesia, with no after-soreness: (*1*) 20 percent solution of Tutocaine in 10 percent ethyl alcohol and 70 percent water; pH adjusted to 8.3 by adding $NaHCO_3$; (*2*) 10 percent solution of Butyn in 10 percent ethyl alcohol and 80 percent water;

pH adjusted to 7.7; and (*3*) 20 percent solution of Novocaine hydrochloride in 10 percent ethyl alcohol and 70 percent water; pH adjusted to 8.2.

104. ORAL CONDITIONS DURING PREGNANCY. *Hugh M. Eaton, D.D.S., Dalhousie Public Health Clinic, Halifax, Nova Scotia.* Investigation limited to 25 pregnant women, ranging from 20 to 45 years of age, from a low class of society. Charts were made showing teeth involved; as many women as possible were required to return each month during gestation. (Specimens of saliva were tested in each case in study by another worker.) Following conditions noted with particular care: (*a*) presence of caries, (*b*) presence of gingival caries, (*c*) presence of gingivitis, (*d*) group of teeth affected, (*e*) number of miscarriages. Literature indicates that pregnancy, per se, does not directly cause increase in susceptibility to caries. Findings in this study support opinions that incidence of caries ascribed to pregnancy is due largely to patients' laxity in oral care. In most cases there is perhaps very definite increase in caries, but it has not been shown that this is due *directly* to pregnancy.

105. STATISTICAL ANALYSIS OF DENTAL PERIODICALS. *Ingo Hackh, A.B., A.M., School of Dentistry, College of Physicians and Surgeons, San Francisco, Calif.* Total of 21,901 references, counted in 21 periodicals, suggest grouping of periodicals into two classes; *referring* and *quoted*, each being subdivided into three groups. Referring periodicals having average of 250 references per volume are *J. A. D. A., Curr. Res. Anesth. Analg.*, and *J. Periodont.* Average of 115 references per volume is found in *Int. J. Orthod., D. Cosmos, D. Outlook, J. D. Research*, and *Ill. D. J.* Periodicals most frequently quoted are, in this order, *J. A. D. A., D. Cosmos, J. D. Research, Int. J. Orthod., Brit. D. J.* List of foreign, and medical and scientific periodicals, included.

106. INCIDENCE OF EPITHELIUM IN DENTAL GRANULOMATA. *Maynard K. Hine, D.D.S., M.S., College of Dentistry, University of Illinois, Chicago, Ill.* (*Rockefeller Fellow in Dentistry*). Incidence and condition of epithelium in dental granulomata were studied in sixty unselected cases. Complete clinical histories were obtained in each instance. Each specimen was cut into sections from 7 to 10 micra thick. Alternate sections were studied microscopically. Epithelium was found in 70 percent of granulomata studied. Of this total, 17 percent showed

epithelial rests; 40 percent, proliferating epithelium; 13 percent, necrosis and cyst formation. No correlation was found between any phase of case history and presence or state of epithelium. Different granulomata on the same multirooted tooth often showed entirely different histological pictures.

107. APPARENT RADIOPAQUE LAYER AT SURFACE OF ENAMEL. *Franklin Hollander, Ph.D., and Eva Saper, A.B., School of Dental and Oral Surgery, Columbia University, New York City.* Grenz-ray (soft x-ray) radiographs of thin ground sections of human teeth manifested a thin (*circa* 0.1 mm.) opaque line around the edge of the enamel, such as would result from a surface layer of excessive calcification. This phenomenon has been observed in ordinary radiographs of ground sections by Thewlis and accepted by him as evidence for hypercalcification of enamel surface. Various factors, however, suggested that this line might be a photographic artefact. Tests gave these results: (*1*) Line was observed in each of 22 human sections (longitudinal and transverse). Variations occurred in width and intensity; frequently present even when body of enamel was overexposed. In 12 sections containing incipient caries-lesions, line was continuous around lesion in all but one case. (*2*) Similar results obtained with several rat incisors. (*3*) Line sometimes occurred at abraded and broken edges in human and in rat enamel. (*4*) Similar line obtained in aluminum foil from which rolled edges had been carefully removed. Presence of this line under such diverse conditions confirmed the suspicion that it did not represent a hypercalcified zone. This was made conclusive by elimination of the effect from radiographs by suitable manipulation. Therefore, there is as yet no evidence for the existence of a zone of hypercalcification at the enamel surface. (Aided by grant from Commonwealth Fund of New York.)

108. DENTAL CARIES: CRITICAL STUDY OF INVESTIGATIONS IN HAWAIIAN ISLANDS. *Alex J. Ker, D.D.S., George Williams Hooper Foundation for Medical Research, and College of Dentistry, University of California, San Francisco, Calif.* After extensive studies of many children in Hawaii, Jones and co-workers concluded that ingestion of alkali- or acid-ash-yielding diet was the deciding factor in susceptibility or immunity to dental decay; that ingestion of alkali-ash-yielding diet raised the blood alkali-reserve, and thus conferred immunity to

dental decay, whereas ingestion of acid-ash-yielding diet had the opposite effect. Unfortunately, information in their dietary survey is unreliable, for many factors were unchecked and no adequate controls provided. It was assumed that ingestion of alkali-ash-yielding diet resulted in significant rise in blood alkali-reserve, but no alkali-reserve determinations were made. Their reports differ from those of other investigators (Michalowsky, McClendon, Tolstoi, Peters and Van Slyke, Bischoff), who have shown that ingestion of acid- or alkali-ash-yielding foods does not cause appreciable effect on internal acid-base balances, as indicated by bicarbonate content in plasma. Krasnow, Karshan, and Krejci, could find no correlation, in 80 cases, between incidence of dental decay and alkali reserve. Boyd, Drain, and Stearns quote numbers of cases of high degree of immunity to dental decay in children suffering from severe chronic acidosis. If Jones and coworkers are correct, i.e., if only high alkali-reserve is the deciding factor, any acid diet to which sufficient $NaHCO_3$ was added should prevent caries to the same degree as change to poi, sweet potatoes, milk, fruit, and other vegetables. Jones and coworkers may have approached the truth, but their hypothesis has not been substantiated.

109. DIALYSIS AND ADSORPTION STUDIES IN SALIVARY CALCIUM, PHOSPHORUS, AND MAGNESIUM. *Frances Krasnow, M.A., Ph.D., Edith B. Oblatt, A.B., and Virginia Rechnitzer, A.B., Guggenheim Dental Clinic, New York City.* Recent studies indicated that differences in stability of salivary protein depended on nature and content of other salivary constituents. This, coupled with observed tendencies of Ca and P, prompted inquiry into effects of dialysis and adsorption of Ca, P, and Mg. No attempt was made to correlate tooth conditions—this was reserved for possible future study. *Results:* (*1*) In ultrafiltrate, Ca varied from 38 to 89 percent (average, 65) of total salivary content; for most cases, values were below 70 percent. (*2*) Dialyzed P ranged from 73 to 100 percent (average, 89); nine-tenths of samples gave more than 80 percent of total P in ultra-filtrate. (*3*) Filtrable Mg fluctuated between 31 and 100 percent (average, 79). Thus, Ca, P, and Mg were equally filtrable, Ca being withheld to greatest degree —35 percent of total compared with 11 and 21 percent for P and Mg, respectively. Possibly Ca is bound characteristically in colloidal form. If bound to protein, it would affect amounts of protein in stable solu-

tion—a condition previously intimated as a possible contributing cause of differences in amounts of protein separable by centrifugation. Experiments have been planned to ascertain relation of salivary protein to non-dialyzable Ca. (*4*) $BaSO_4$-adsorption tests indicated that average percentages adsorbed from saliva were inversely proportional to those dialyzed: 81, 67, and 57 percent for Ca, P, and Mg, respectively. Average percentages of Ca and P adsorbed from ultrafiltrate were practically equal.

110. ORAL ROENTGENOLOGY: TECHNICAL PROCEDURE FOR FURTHERING ADVANCEMENT TOWARD ANATOMICAL ACCURACY. *Donald W. McCormack, B.S., Senior Dental Student, College of Dentistry, and George Williams Hooper Foundation for Medical Research, University of California, San Francisco, Calif.* If oral roentgenology is to keep pace with other fields of oral diagnosis, several technical factors must be revised. Foremost of these is angulation. The principle of *bisecting the angle*, or that of following calibrated angles as used with dental machines, can only produce distorted images. The only possibility of producing anatomically correct images of teeth and surrounding structures is to direct central rays in a line perpendicular to the long axis of the teeth, and paralleling the film to this long axis. This procedure is now possible in all areas of the mouth, but necessitates use of a stiff metal-backed film placed away from the teeth, even as far as the opposite side in the upper posterior regions. This film-positioning necessitates greater target distance, at least 36 inches, to minimize enlargement and penumbra. Other factors, to obtain further standardization of results, are (*a*) stabilization and settings of apparatus (lower kilo-voltage-peak and higher milliamperage will give greater contrast—other factors being the same—than high kilo-voltage-peak and low milliamperage; optimum is approximately 40 Kv.P. and 30 Ma.); (*b*) size and condition of focal spot; (*c*) exposure times; (*d*) position of patient—reclining position best; (*e*) dark-room procedure—chemical reduction of films should be discontinued; (*f*) mounting; (*g*) viewing and filing. It is impossible to obtain anatomical accuracy, or any standardization, with dental x-ray units now on the market.

111. SILICATE CEMENTS. *Ernest Matthews, Ph.D., M.Sc., L.D.S., Guy's Hospital, London, England.* An attempt has been made to

analyse the supposed irritant factor in silicate cements. Many suggested factors have no basis in fact. Reactions of cement mixes depend greatly on technique. A plea is made for routine standardization of the powder: liquid ratio to give optimum results. An organized attempt under controlled conditions will be made to establish degree of incidence of any specific reaction by dental tissues to silicate cements, contrasted with other filling materials, in the light of recent knowledge regarding their behavior.

112. SEVEN YEARS OF DENTAL AND MEDICAL OBSERVATIONS ON CHILDREN AGED THREE TO SIX AT ENTRY. *F. W. Morse, Jr., M.D., P. K. Losch, D.D.S., E. S. Godfrey, D.M.D., Luisa Castaneda, D.D.S., Dental School, Harvard University, Boston, Mass.* In October, 1928, observations were begun on children who entered before the age of 6, and will be observed to the age of 14. New cases now enter before the third year. A complete record of caries, hypoplasia, condition of soft tissues, and oral hygiene is kept. X-ray photographs of jaws and wrists are made annually; also mouth models. At each visit culture of the mouth is made in pH-5 broth. Sample diets are recorded. An annual physical examination is made, and history recorded. Few recorded facts have as yet been analyzed statistically; most of the work thus far has been collection of data. These children, coming from homes where there is definite interest in health, show relatively low percentages of caries, with about 40 percent free from it. No one factor has appeared as related to degree of caries; but where several favorable influences are found, there is low incidence of caries or none at all. For deciduous teeth with caries in developmental grooves, the highest percentage incidence is 3.02 in age-group 6–7. For deciduous smooth-surface caries, highest percentage is 15.37 at 8–9. For permanent teeth with caries in developmental grooves, highest figure is 6.55 percent at 7–8; for smooth-surface caries, 8.65. No significance can be attached to the relation of rate of growth of child to incidence of caries in this group.

113. TOOTH ERUPTION VERSUS TOOTH ELEVATION. *Egon Neustadt, M.U.D., New York City.* Under "eruption," two distinctive phenomena are included, but they should be differentiated. "*Eruption*" is here reserved to indicate emergence from gingiva; "*elevation*," to indicate position with reference to plane of occlusion. Every tooth

has an inherent tendency to grow toward the opposing jaw. If contact is made with the opposing tooth at the proper occlusal contact area, the tooth has reached its *normal* place in the plane of occlusion. *Tooth elevation*, however, continues beyond the normal plane of occlusion under these conditions: *A. Malpositions*—(*a*) *Anterior teeth:* loss of occlusal contact permits excessive elevation, causing (*1*) excessive overbite (closed bite), (*2*) reversed overbite (lower incisors biting in front of upper). (*b*) *Posterior teeth:* opposing molars and premolars grow past each other. *B. Extractions*—(*a*) *Direct results:* excessive elevation after loss of opponents. (*b*) *Indirect results:* after loss of lower first molar—incisors, owing to drift, lose occlusal contact and elevate further (excessive horizontal and vertical overbite). *A tooth may be prevented from reaching the plane of occlusion for the following reasons: A. Malpositions*—Abnormal occlusal contact produces: (*1*) decreased vertical overbite, or (*2*) edge-to-edge bite. *B. Forces opposing tooth elevation*—(*a*) Habits: non-occlusion ("open-bite"). (*b*) Increased resistance: impacted teeth. (*c*) Disturbance of normal elevating power: impacted teeth. (*d*) Artificial interference: depressed teeth. (*J. Den. Res.*, 1932, *12*, 539; published in *Den. I. of Int.*, 1935, June.)

114. MEDICO-DENTAL CASE RECORDS. XII: FUSOSPIROCHETAL ANGINA. *Bissell B. Palmer, D.D.S., F.A.C.D., and Malcolm W. Carr, D.D.S., F.A.C.D., Fifth Avenue Hospital, New York City.* White female, 55; advanced intraoral fusospirochetal disease resulting from chronic periodontal fusospirochetal infection of right mandibular third molar. In attempt to eradicate infection, tooth had been removed before patient came under observation. When first seen, there was area of sloughing where tooth had been removed, extending into floor of mouth (involving side and base of tongue) and along anterior faucial pillar (involving soft palate to median line); also extensive acute cervico-facial cellulitis. Operation for incision and drainage; severe secondary hemorrhage occurred (possibly from erosion of larger vessel); patient expired. *Conclusions:* (*1*) Fusospirochetal angina is a potentially serious clinical entity. (*2*) Local factors, such as neglect of chronic infection and trauma in presence of chronic or acute infection, as well as secondary or associated constitutional factors, influence the clinical course of the disease. (*3*) When extensive ulceration and sloughing have occurred, prognosis is invariably bad. (*4*) Death from

fusospirochetal angina may be due to extension of the local pathologic process to the glottis (causing acute edema), to toxemia, or metastatic lesions elsewhere.

115. CULTIVATION IN VITRO OF TISSUES FROM ENAMEL ORGAN AND DENTAL PULP. *Henry Pinkerton, M.D., and Paul Boyle, D.M.D., Medical and Dental Schools, Harvard University, Boston, Mass.* Tooth germs from new-born kittens have been removed aseptically by laying bare the inferior surface of the body of the mandible, removing cortical bone, and dissecting out contents of dental follicles. Entire tooth germs, with included enamel and dentin cusps and small pieces of enamel organ and of dental pulp, have been explanted. Both ectodermal and mesodermal tissues grew readily and retained many histological characteristics throughout several transplantations. No new formation of either enamel or dentin has as yet been obtained. In-vitro behavior of connective tissue of dental pulp was similar to that of connective tissue from other locations, excepting presence in certain transplants of long cell-processes. Cells from the odontoblast layer seemed to retain their peculiar property of developing long cytoplasmic processes even after several transplantations. Proliferation of cells from enamel organ was always accompanied by metaplasia toward a stratifying squamous-epithelium type. This change was similar to transitions observed normally in enamel organs as erupting teeth approach oral epithelium. Ameloblasts were noted that had developed processes running to two or more enamel rods. In certain areas, where bits of dentin were contained in the transplant, enamel epithelium grew over the dental-pulp surface, thus occupying the normal position of odontoblasts. In such areas there was evidence of resorption of dentin by cells of enamel organ. In general, ectodermal and mesodermal tissues behaved like all tissue cultures—grew freely, but tended to lose characteristic morphology associated with specific function.

116. EFFECT OF HEREDITY ON HUMAN ENAMEL. *E. Roberts, B.S., Ph.D., Agricultural Experiment Station, University of Illinois, Urbana, Ill.* In a family—pedigree studied for six generations—enamel is absent from both deciduous and permanent teeth, all of which are soft and wear away rapidly. Enamel is not missing in any child unless it is visibly missing in at least one parent. This means the condition is

dominant in expression, and also apparently due to a single-gene difference from normal conditions. On this basis a theoretical ratio of 1:1 would be expected among the children, one parent of which showed absence of enamel. The observed ratio is 18 normals to 19 abnormals. In soft enamel-free teeth one would expect to find decay and pain, but no evidence of these troubles was discovered in examinations of three different individuals. Possibly atrophy of nerves accounts for absence of sensation. (*See* abstract 1.)

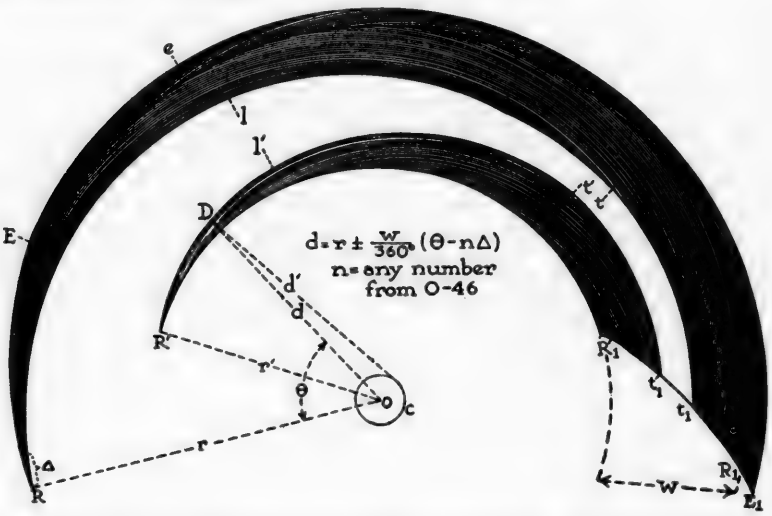


Fig. 5. Diagram showing geometric construction of rat incisor, with formula therefor.

117. SIMPLIFIED BONE-CLEARING METHOD FOR COMPARISON OF X-RAY FINDINGS IN GROWING ANIMALS. *Harry H. Shapiro, D.M.D., and Karl E. Kellner, College of Physicians and Surgeons, Columbia University, New York City.* In a previous post-natal x-ray study of developing calcification centers in jaws, and ossification centers in limbs, of growing cats, results were dependent upon accuracy of x-ray findings. To check x-ray photographs by control procedure, we developed a simplified clearing method differing from that of Spalteholtz, and modifying that of Schultz. The new method eliminates use of expensive oils and the usual dehydration technique.

118. GEOMETRIC CONSTRUCTION OF RAT INCISOR. *S. R. Steadman,*

*B.S., D.D.S., M.S., and I. Schour, B.S., D.D.S., M.S., Ph.D., College of Dentistry, University of Illinois, Chicago, Ill.* Experimental measurements show that the distance between adjacent daily appositional lines in enamel and dentin of rat incisors is 16 micra. Eruption rate of the upper incisor is approximately 2/7 mm. per day. Utilizing these facts, it has been possible to obtain the formula which guides this study. *Fig. 5* employs a single center, *o* (origin of coördinates), from which all radial lines are drawn, and illustrates actual appositional lines of both enamel and dentin. The following reference lines are arcs described about the center *o*: enamel surface, $EE_1$; dentino-enamel, $RR_1$ (of constant radius $r$), and dentino-cemental, $R'R'_1$ (of constant radius $r'$), junctions; and boundaries of pulpal slit, $tt_1$ and $t't'_1$. Daily appositional lines composing enamel, *e*, labial dentin, *l*, and lingual dentin, *l'*, are segments of Archimedean spirals from the same center, *o*, as an axis. *D* is any point on any appositional line, its radius vector being *d*; Θ is the angle through which *d* has rotated from the reference line, *OR*. Adapting the formula for the Archimedean spiral, we obtain our formula,

$$d = r \pm \frac{w}{360^\circ}(\theta - n\,\Delta),$$

where $w$ equals $r$–$r'$; $n$ is an integer whose range is 0-46 (number of days revealed by tooth) for the adult rat; and Δ is the angle subtended by an arc along $RR_1$ of 2/7 mm. ÷ 3.64 mm. radians (on rat tooth), which is approximately 4.5° for an adult rat. The line *d'* accords with the construction method of drawing either set of appositional lines, *l'* or *e*; *o* is the center of the construction circle, *c*, whose circumference is $r$–$r'$; the construction method for the *l* lines is similar to that of the *l'* lines, but the tangent is drawn to the opposite side of the construction circle. The + of the sign ± is for the *l'* and *e* lines; the −, for the *l* lines.

119. VALUE OF ACID FUCHSIN AND GENTIAN VIOLET FOR DIFFERENTIAL CULTIVATION OF ORAL BACTERIA. *W. E. Taylor, D.D.S., and B. G. Bibby, B.D.S., Rockefeller Fellows in Dentistry, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.* Thirty tests were made to determine whether various mouth bacteria differed sufficiently in resistance to acid fuchsin and gentian violet to permit use of these dyes for isolation of special organisms. Pure

cultures and mixed suspensions were placed in various dilutions of dye, and held for different periods at incubator and room temperatures; subcultures were made in appropriate media. Observed differences were insignificant for purposes of selective culture. In tests with solid dye-containing media, organisms under anaerobic conditions grew in higher concentrations of dyes than under aerobic conditions. Fusiform bacteria seemed particularly resistant to gentian violet, and Leptotrichia showed definite resistance to acid fuchsin.

120. CASE OF GENERALIZED OSTEOMYELITIS WITH INTERESTING JAW INVOLVEMENT LEADING TO FORMATION OF FOLLICULAR CYST. *Kurt H. Thoma, D.M.D., Dental School, Harvard University, and Tumor Clinic of Beth Israel Hospital, Boston, Mass.* Patient, aged 10, suffering from streptococcus septicemia, and multiple osteomyelitis: right and left tibiae, right and left humeri, and right ulna, involved; also left side of mandible. Case throws light on pathogenesis of follicular cysts. Ramus and posterior part of mandible were involved, and osteomyelitis no doubt stimulated cyst formation in enamel organ of developing second inferior molar. First available x-ray shows normal tooth germ in crypt. Second x-ray, five months later, shows lateral cavitation on bony crypt—first indication of cyst formation. Cyst then continued to develop until, three years after onset, involved very large area of mandible—and displaced second molar to inferior border, and third molar into coronoid process of ramus. X-rays illustrate development of follicular cyst during period of three years. Case proves that follicular cysts may be caused by stimulation from local chronic infection, such as osteomyelitis of jaw.

121. QUANTITATIVE METHOD FOR INDIUM IN DENTAL PRECIOUS-METAL ALLOYS. *Leslie G. Wright, B.S., M.S., Research Division, J. M. Ney Company, Hartford, Conn.* Of many elements intentionally used in dental precious-metal alloys, indium is probably newest and certainly least studied. Before scientific investigation can reveal the influence of this metal on physical properties of alloys, it is necessary to determine quantity of indium in alloys, as there is no certainty that this low-boiling element is not volatilized from molten solution in manufacturing processes. Literature was searched for methods of chemical analysis of indium alloys, but no information was found that could be directly applied, although certain methods for determining

indium in special combinations aided materially in solving the problem. It was necessary to devise a method for indium in alloys containing any or all of these elements: copper, gold, iridium, iron, nickel, palladium, platinum, rhodium, silver, tin, zinc. It was important that a method be incorporated into Swanger's "Analysis of Dental Gold Alloys," Bureau of Standards paper no. 532, which is conceded to be the best method for the elements usually present in dental precious-metal alloys. Some tested methods failed; but it was found that, by taking certain preliminary precautions, indium is completely precipitated by ammonia after removal of the above-named elements excepting nickel and zinc. The precipitate is apt to be contaminated with iron and salts, which are eliminated by solution and reprecipitation of the indium as sulfide in acid solution. Because indium in indium sulfides cannot be quantitatively determined directly, it is necessary to reprecipitate with ammonia, and ash to $In_2O_3$. (To be published in *J. Den. Res.*)

## XII. Executive Proceedings

### A. Quotations from reports; all adopted by the association

#### *a. Report of Council*

At our twelfth general meeting, in Chicago in 1934, it was voted to accept ownership of the *Journal of Dental Research*, as of January, 1934. All conditions of management were, by vote, referred to the Council, for study and decision. The Council, acting on the reports of several committees, voted last June to entrust the management of the *Journal* (*a*) to a board of editors to consist of one representative of each section, to be elected by the respective sections, this board to select its own officers, committees, and other agents; (*b*) the five chief active officers of the Association to serve as the Acting Board of Editors pending organization of the Permanent Board. The sections were promptly notified accordingly, and at once began the organization of the Permanent Board of Editors. Considerable time was necessary for adequate correspondence with the sections that are located farthest from headquarters, and the summer vacations were responsible for much unavoidable delay, but the organization of the Permanent Board was recently completed. Meanwhile, as voted by the Council, the *Journal* has been conducted by the five chief active officers of the Association as the Acting Board [see reports below].

The Council, besides nominating officers for the ensuing year, as indi-

cated on the official ballots, has voted to present the following nominations for membership, and recommends the election of each [see register below: B, b.]

The *Treasurer* reported that the income from dues slightly exceeded the expenses for the year. The *Trustees* reported that the Endowment Fund amounted, on March 15, 1935, to $1,151.75.

The Association received, from the "Viennese Arrangement Committee of the Ninth International Dental Congress of the F. D. I.," a cordial invitation, dated March 1, 1935, to participate in this Congress. We recommend that the invitation be accepted; that Dr. W. H. G. Logan, Chairman of the National Committee representing the American Dental Association in the "F. D. I.," be requested to reply to this effect; and that the General Secretary be instructed (*a*) to notify all the members of the Association that the invitation has been accepted, and (*b*) to urge the desirability of coöperation by the members individually.

We recommend adoption of the following resolution:

*Whereas* there is a concerted effort among some sensational newspapers, and a small number of misguided persons desiring to hinder medical progress, to pass antivivisection legislation; and

*Whereas* we believe that scientific medicine has contributed significantly to the welfare of humanity, as well as to animals; therefore be it

*Resolved* that this organization endorses legislation intended to facilitate the acquisition of further knowledge of scientific medicine and public health by allocating to accredited research and teaching institutions unclaimed, unredeemed, impounded animals for humane use, under proper legal regulations.

### *b. Report of Secretary*

The General Secretary, besides attending to the routine duties of the Secretaryship, served as Chairman of the Acting Board of the *Journal*, and also as clerk for the Council and for the Permanent Board of Editors in the lengthy and detailed correspondence relating both to the Council's decisions on the general plan of management of the *Journal*, and the Permanent Board's decisions on the procedures to make that management effective [see reports below].

I greatly regret to report the deaths, during the year, of Dr. Kaethe W. Dewey, Dental School, University of Pittsburgh, Pittsburgh, Pa., and Dr. Moriz Leist, University of Vienna, Vienna, Austria. I recommend that a standing Necrology Committee, to consist of the three senior past-presidents, be appointed to give adequate expression annually to the sentiments of the Association on the death of members.

The following members resigned their membership: Dr. Howard C.

Benedict, formerly of the Chicago Section. Mrs. R. F. Farquharson, formerly of the Toronto Section. Mrs. Bernice T. Horton, formerly of the Columbus Section. Dr. Anne G. E. Mackenzie, formerly of the Winnipeg Section. Dr. Ralph P. Smith, formerly of the Halifax Section. These resignations, by provision of the Constitution, became effective as of the dates of their receipt by the General Secretary. Each of these former members has discontinued research in dental relationships.

The following members have been dropped from membership in the Chicago Section: Drs. Ralph H. Fouser and F. B. Moorehead. During the past two years the General Secretary has sent each of these members both routine and special notices inviting continuance of their interest. No reply has been received, although some of the communications to each were sent by registered mail. . . . I therefore recommend that the membership of Drs. Fouser and Moorehead in the Association be formally discontinued as of March 17, 1935. . . ."

[The General Secretary, expressing his feeling that a younger man should be selected to succeed him, presented his resignation, to be effective as of November 1, 1935, after all work relating to the proceedings of this meeting will have been concluded and before preparations for the next general meeting should be initiated.]

### *c. Report of Acting Board of Editors*

Last June, the Council having voted to place the editorial management of the *Journal of Dental Research* in charge of the five chief active officers as an Acting Board of Editors, pending organization of the Permanent Board of Editors, we proceeded as usual, the former Executive Officer of the Board of Editors of the *Journal*, who is also General Secretary of our Association, continuing to serve in that relation, referring general questions of policy to the Acting Board.

During 1934, the *Journal* received grants of $1000 each from the First District Dental Society of the State of New York, the New York Academy of Dentistry, and the American College of Dentists, in support of the *Journal's* previous policies. With this assistance, it was possible to publish a volume of 500 pages. The Permanent Board, finally organized at this meeting, will presumably take charge beginning with the work on the issue for April. The financial assistance already assured for 1935 consists of $1000 each from the New York Academy of Dentistry and the American College of Dentists, and $500 from the First District Dental Society of the State of New York. The resources now available for 1935 would not be sufficient to support a volume of more than about 400 pages, and additional

funds should be obtained, not only to prevent depletion of the volume for 1935, but also to enable the Board of Editors to increase the number of pages to be published in support of the dental research that, we are happy to see, is steadily increasing. The Executive Committee and the Finance Committee of the Permanent Board of Editors have been given the facts in this situation [see report below].

During our period of service, we suggested to the Trustees of the American Dental Association that the most elaborate and most expensive research papers presented to the *Journal of the American Dental Association* be published in the *Journal of Dental Research* under the following main conditions:

(*a*) The expenses of publishing these papers in the *Journal of Dental Research* to be paid by the American Dental Association, the net income of the *Journal of Dental Research* to be neither increased nor decreased by this service for the A. D. A.

(*b*) A representative of the A. D. A. to be a member of the Board of Editors of the *Journal of Dental Research*, to be in charge of manuscripts presented by or for the A. D. A.

(*c*) Members of the A. D. A. *volunteering* to subscribe for the *Journal of Dental Research* to receive copies at 50 percent of the regular subscription price.

At the February meeting of the Trustees of the A. D. A. it was voted that, for the present, this proposal could not be accepted, but it was also voted to defer final action to a future meeting.

### *d. Report of Permanent Board of Editors*

Immediately after the Council voted to entrust the management of the *Journal of Dental Research* to the Permanent Board of Editors, as related in the foregoing report of the Council, the sections were notified of the Council's decision.

The sections, after extended correspondence, selected their representatives in the Permanent Board, who in turn, after adopting a group of guiding principles in the nature of by-laws, decided to place the active editorship in charge of an Executive Committee of three, to be aided by a Finance Committee of three. The members of the Executive Committee, as very recently selected, are: Theodor Rosebury, *Editor;* Edward H. Hatton, *Associate Editor;* Paul C. Kitchin, *Assistant Editor*. The General Secretary has been selected to serve as *Temporary Second Assistant Editor*, pending completion of the reorganization, and the successful initiation of the new editorial management. The members of the Finance Committee, also the three trustees of the Association's endowment fund, are Bissell B. Palmer, *Treasurer*, Arthur D. Black and Russell W. Bunting.

*e. Report of Executive and Finance Committees of Journal of Dental Research*

The Executive Committee and Finance Committee of the Permanent Board of Editors of the *Journal of Dental Research*, after a joint meeting today (March 17, 1935), together present the following report:

*1.* Dr. Rosebury was elected Chairman of the Executive Committee, and Dr. Palmer Chairman of the Finance Committee. The committees jointly recommend that Dr. Rosebury be elected Chairman of the Board of Editors.

*2.* The members of the Executive Committee agree that, having been selected by the Board of Editors to undertake and carry on the work of editing the *Journal of Dental Research*, they have accepted the assignments as a duty rather than an honor, recognizing their individual inadequacies for the work involved. Particularly they recognize the superlative qualities that enabled Dr. Gies to build the *Journal* from a small inception to an accepted position of full equality with the best scientific periodicals of our time. They should not have agreed to undertake the editorial duties of the *Journal* had not Dr. Gies made clear beyond question that he wishes them to do so, and they depend upon him absolutely to initiate them into the work involved, and not to relinquish editorial responsibility in fact, though he relinquish it in name, until he is satisfied that the editors are able to carry on alone. The Board of Editors selected Dr. Gies as "Temporary Second Assistant Editor" of the *Journal* only because he made it clear that he wishes to have it so. By reason of the foregoing considerations the committees jointly recommend:

(*a*) That, as proposed by Dr. Palmer, at the St. Paul conference of the editors, last August, Dr. Gies be elected Editor Emeritus of the *Journal of Dental Research.*

(*b*) That, as proposed by Dr. Hatton at the said conference, the *Journal* carry permanently on its front cover (title page) the legend: "Founded by William J. Gies in 1919," both (a) and (b) having been approved by sections and editors individually.

(*c*) That Dr. Gies be elected a permanent member of the Executive Committee of the Board of Editors.

*3.* The two committees agreed that arrangements be made as soon as possible to include advertisements in the *Journal* as a means of increasing the *Journal's* income, such advertisements to conform to the stipulations of the Code on Advertising adopted by the American Association of Dental Editors.

*4.* The two committees offer the following statement regarding the finances of the *Journal:* The present cost of the bimonthly publication of

the *Journal*, consisting of a total of 500 pages, is approximately $4000 per year. To this amount at least $1000 should be added to provide needed clerical assistance; and it is clear that twice this amount ought to be available. The present income of the *Journal*, available for the year 1935, made up chiefly of contributions from societies, is nearly $3000. It will therefore be necessary to raise a minimum of $2000 additional to continue the publication of 500 pages for the current year.

*5.* The two committees recommend that the following projects, to meet the *Journal's* deficit during the current year, and to place the *Journal* on a permanently sound financial basis, be put into effect by the Finance Committee:

(*a*) Solicitation of advertising.

(*b*) Increase of subscriptions by appealing to a selected list of dental societies for group subscriptions for their entire membership. Where this cannot be accomplished, special committees of these societies should be appointed to solicit individual member subscriptions.

(*c*) Appeal to the several sections of this Association to secure subscriptions from 100 percent of their members.

(*d*) Appeal to dental colleges in which research is being carried on to contribute from $100 to $300 per year, the amounts to be approximately in relation to the student enrollments of the schools.

(*e*) Appeal to one or more philanthropic agencies for grants.

*6.* The two committees wish to express their gratitude, on behalf of the Association, for contributions in 1934 to the *Journal* from the First District Dental Society of the State of New York, New York Academy of Dentistry, American College of Dentists, Academy of Stomatology (Philadelphia), Allied Dental Council (New York), American Academy of Dental Science, American Stomatological Association, Kings County (N. Y.) Dental Society, Odontographic Society (Chicago), Robert R. Andrews Society for the Promotion of Research (Tufts).

[This report of the joint committees was adopted, by the Association, subject to confirmation of all matters of policy by the Permanent Board of Editors, to give all sections of the Association opportunity to participate in the final decision. This confirmation was given by unanimous vote of the editors, and so announced by the Chairman to all members of the Board.]

### B. LIST OF OFFICERS, AND NEW MEMBERS, ELECTED

#### *a. Officers (1935–36)*

HONORARY: *Vice-presidents*—R. GORDON AGNEW, Chengtu. J. C. MIDDLETON SHAW, Johannesburg. EVELYN SPRAWSON, London. KAREL

WACHSMANN, SR., Prague. HERMANN WOLF, Vienna. JÓSEF SZABÓ, Budapest.

ACTIVE: *President*—THEODORE B. BEUST, Univ. of Louisville. *President-elect*—WILLIAM G. SKILLEN, Northwestern Univ. *Vice-president*—PAUL C. KITCHIN, Ohio State Univ. *Treasurer*—BISSELL B. PALMER, Fifth Avenue Hospital, New York City. *Secretary*—WILLIAM J. GIES, Columbia Univ. *Trustee of the Endowment Fund* (three years)—ARTHUR D. BLACK, Northwestern Univ.

*b. New members*[9]

*Chengtu, China.* HARRISON J. MULLETT, L.D.S., D.D.S., B.Sc. (Dent.), Dean of Dentistry and Prof. of Prosthodontology, College of Medicine and Dentistry, West China Union Univ.

*Chicago, Ill.* HARRY H. ASHER, D.D.S., M.S., Assistant in Metallurgy, Dental School, Univ. of Ill. ALBERT A. DAHLBERG, B.S.D., D.D.S., Instr. in Surgery, in charge of Dental Surgery, Univ. of Chicago. ROBERT M. STEPHAN, D.D.S., M.S., Instr. in Dental Pathology and Therapeutics, Dental School, Univ. of Ill.

*Columbus, Ohio.* J. B. BROWN, M.S., Ph.D., Assoc. Prof. of Physiological Chemistry, CARL O. BOUCHER, D.D.S., Instr. in Dental Prosthesis, and LYLE S. PETTIT, D.D.S., Demonstrator in Dentistry (Oral Hygiene), Dental School, Ohio State Univ.

*Halifax, N. S.* HUGH M. EATON, D.D.S., Birks Building.

*New York, N. Y.* CHARLES G. DARLINGTON, M.D., Prof. of Pathology, Dental School, New York Univ. THOMAS B. KING, D.D.S., Assistant Visiting Oral Surgeon, Metropolitan Hosp. ISAAC NEUWIRTH, B.S., Ph.D., Assoc. Prof. of Pharmacology and Therapeutics, Dental School, N. Y. Univ. M. RUSSELL STEIN, D.D.S., Instr. in Oral Anatomy, Dental School, Columbia Univ.

*Philadelphia, Pa.* HERMAN R. CHURCHILL, Tandarts, D.D.S., D.M.D., Asst. Prof. of Dental Histology, Histopathology and Comparative Odontology, Dental School, Univ. of Pennsylvania.

*Pittsburgh, Pa.* JOHN S. OARTEL, D.D.S., M.S., F.A.C.D., Asst. Prof., Dental School, Univ. of Pittsburgh.

*Richmond, Va.* HOLMES T. KNIGHTON, D.D.S., Instr. in Operative Dentistry, Dental School, Medical College of Virginia.

*Rochester, N. Y.* MAYNARD K. HINE, D.D.S., M.S., Rockefeller Fellow in Dentistry, MARIAN L. LEFEVRE, B.A., Graduate student engaged in dental research, HAMILTON B. G. ROBINSON, D.D.S., Rockefeller Fellow

[9] A list of the members, as of December 1, 1934, was published in the *Journal of Dental Research*, 1934, *14*, 471; Dec.

in Dentistry, School of Medicine and Dentistry, Univ. of Rochester. RALPH S. VOORHEES, JR., D.D.S., Instructor, Rochester Dental Dispensary School for Dental Hygienists.

*St. Louis, Mo.* OTTO W. BRANDHORST, D.D.S., F.A.C.D., Chairman, Socio-economics Committee, Missouri State Dental Association, 4500 Olive St.

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